



Australia-India Council Research Project

Developing India-Australian Collaboration Towards a Horticulture Centre of Excellence



FINAL REPORT

Genesis Horticultural Solutions

December 2019

Tony Bundock and Stephen Manallack



Australian Government



Australia-India Council



Genesis Horticulture Solutions Pty Ltd thanks the Australian Government through the Australia India Council which provided a grant to make this research project possible.

Contacts

Tony Bundock

tony@genesis-hort.com.au

Mobile +61 409 007 610

Stephen Manallack

stephen@manallack.com.au

Mobile +61 419 532 418

Overview

While the Genesis team found a diverse range of opportunities for Australia in the Indian horticulture industry, our core findings were that major current opportunities are in:

Protected Cropping

Protected Cropping (PC) can be defined as the production of horticultural crops within, under or sheltered by artificial structures and/or materials to provide and/or enable modified growing conditions and/or protection from pests and adverse weather.

Protected cropping includes the use of greenhouses and glasshouses, shade houses, screen houses and crop top structures.

Controlled Environment Horticulture (CEH) is the most modern and sophisticated form of protected cropping – which might be relevant to corporate farms. CEH combines high technology greenhouses with hydroponic (soil-less) growing systems. CEH makes it possible to consistently and reliably control or manipulate the growing environment and effectively manage nutrition, pests and diseases in crops.

Hydroponics

Hydroponic growing is a method of crop production using a soilless growing medium with nutrients supplied in a liquid form. The choice of substrate can be varied to suit the crop and climatic requirements. Hydroponic growing also includes growing in a flowing nutrient stream without utilising a solid medium. This is known as nutrient film technique.

Hydroponic growing offers the grower a much more refined level of control of water and nutrients with increased crop yields. The nutrient solution can also be recycled giving greater efficiency in water and fertiliser usage.

Modifications for India

Taking into consideration the current state of horticulture in India plus issues relating to cost, modifications in both protected cropping and hydroponics would need to occur to produce innovative solutions for India. Off-the-shelf solutions used in the west are unlikely to find market acceptance in India.

Research Centres and Farmer Product Companies (FPC)

There is an opportunity for an Australian Centre of Protected Cropping and Hydroponics to be embedded in at least one of the Indian Government agricultural research centres and in a private research centre in Tamil Nadu. The Government program of encouraging FPC's is creating huge unmet demand for services relating to large farm management, IT, insurance, post-harvest, marketing, finance, IoT and more.

Table of Contents

Contacts	2
Overview	3
Acknowledgments	6
Executive Summary – Specific for Australia India Council	7
Executive Summary - General	11
Introduction	16
The Indian Agricultural Sector	17
Boosting farmer incomes in India	19
Availability of water in India	19
Understanding of hydroponic terminology in the Indian market	20
The range of farms in India	20
Initial travel and meeting itinerary for program	22
Interview reporting and findings	25
J Farm Research Centre – Tractor and Farm Equipment Ltd	25
Indo-Australia Chamber of Commerce	29
Tamil Nadu Department of Horticulture	31
Public Relations Society of India	33
Aus. Indian Rural Development Foundation & Australian Indian Resources Ltd.....	34
ProActive Agri Solutions Pvt Ltd	36
Independent Horticultural Consultant – Anil Patil	38
Aditya Birla Group	45
Weikfield Products Ltd	48
Jain Irrigation – Dr. Sangeeta Ladha.....	50
Cravo group – Rajender Kumar and Shashank Jain	52
VAS Agri Pvt Ltd / Junga FreshnGreen.....	55
Counsellor Agriculture, Australian High Commission	56
Additional Interview – 1	59
Additional Interview – 2	61
Additional Interview – 3	64
Additional Interview – 4	65
Additional Interview – 5	67
Additional Interview – 6	70
Additional Interview – 7	73

Conclusions and the way forward	76
Initial and short-term actions	76
Medium and long-term actions	76
Genesis Report and “An India Economic Strategy to 2035”	78
Challenges to implementing Australian technology in Indian Horticulture	82
Exports	84
Attachment One	85
Attachment Two	104
Attachment Three.....	107
Attachment Four.....	112
Media coverage.....	123
Social media - details of all LinkedIn posts.....	124
Social media - details of all Facebook posts	137
Social media - details of all Twitter posts	149
Hortidaily Article – Saturday 16 th November 2019.....	159
Relationships formed.....	161
Bibliography	162
Genesis Horticultural Solutions Policy Paper AIC2019197	163

Acknowledgments

The Genesis Horticultural Solutions team wish to acknowledge the support of the following individuals and organisations:

Australia India Council (part funding of the research project)

Federal Government of Australia – Department of Foreign Affairs and Trade, High Commission, Delhi

State Government of Victoria – Victorian Government Business Office, Bengaluru and Mumbai

Indo-Australia Chamber of Commerce

Government of India

State Governments of Tamil Nadu, Karnataka and Maharashtra

KPMG (Australia and India)

Priva Oceania

Cravo Equipment Ltd

Every individual and company in India who reached out, attended meetings and gave so freely of their time and knowledge (see reports in this document)

Executive Summary – Specific for Australia India Council

This report details the activity and findings of a collaborative team from Genesis Horticultural Solutions who undertook a research investigation into the potential of developing an India-Australian collaboration towards a Horticultural Centre of Excellence.

It is important to note that one key finding of the research was that the concept of “stand alone” Centres of Excellence” may not be the best way to achieve desired outcomes. These tend to be viewed by the local horticultural community as isolated and as “foreign” rather than as relevant to India.

For that reason, the Genesis team have developed a fully collaborative approach which provides Australia the potential for a much more cost effective and high impact option of for developing an Australian Centre of Horticulture Excellence within existing research or commercial locations.

The next step could be an Indian-Australian Conference on Hydroponics and Controlled Cropping innovations, which could have the right effect of educating and drawing the target market out – this could be a project held in conjunction with peak organisations such as Protected Cropping Australia, and the Victorian Hydroponic Farmers Federation, and possibly supported by national or state government in Australia.

Expected Project specific result 1

Create at least three India-Australia groups on future Controlled Horticulture/Hydroponics Collaboration, leading to detailed planning and implementation of a Horticulture Centre of Excellence

The Genesis India Horticultural Collaboration Project 2019 has begun the process of creating four collaborative groups – indicative of the move away from “stand alone” centres. The intent is to use the four groups in combination with a “VIRTUAL CENTRE OF HORTICULTURE EXCELLENCE” incorporating technology innovation. The groups are:

1. Maharashtra – Aditya Birla Group – Horticulture Commission, Ministry of Agriculture and Farmers Welfare – Nashik Smart City – Jain Irrigation Services
2. Maharashtra – Weikfield Pune Group. Pune Smart City, Farmogo and Chaitanya Agro Pvt Ltd.
3. Andhra Pradesh – Australia India Resources Mining Industry Group
4. Tamil Nadu – J Farm, Tractor and Farming Equipment Ltd, TN Horticulture Development Authority (TANHODA)

Expected Project specific Result 2

Provide a pathway for the Australian TAFE sector into India via this program - training and train-the-trainer.

The Genesis India Horticultural Collaboration Project 2019 found horticultural skills training and ‘train the trainer’ programs to be in great demand - with only limited services for controlled cropping and hardly any for small scale or commercial hydroponics. Working in conjunction with the “four groups” and with the “Virtual Centre” there is now potential to develop opportunities for the Australian TAFE sector to provide skills training and train the trainer as part of the program. This can be viewed as the gateway or market disruption activity that can bring high profile to the program. The project team are now developing course delivery options from Australia via technology for the Indian market.

Expected Project specific Result 3

Involve and link women from the horticulture/hydroponics sectors in India and Australia.

The Genesis India Horticultural Collaboration Project 2019 has already agreed as a CSR initiative to provide their services free to develop a product model design for a Nutrient Film Technique hydroponic unit that could be made available via the Weikfield Group for use by women in Maharashtra rural areas. Working with the Weikfield Group, the Genesis team will provide the design of the project and initial skills training, and the Weikfield team will look after “to market” services. Broadly we believe each of the identified projects should contain a special initiative for rural women. Culturally, we know rural farmers are deeply conservative and any new initiative in controlled cropping or hydroponics is likely to find more success among rural women.

Expected Project specific Result 4

Create a plan and collaborative group in three Indian states to create an India-Australia strategic and business plan to build a Centre of Excellence and training program

The Genesis India Horticultural Collaboration Project 2019 has identified four projects covering three states:

1. Maharashtra
2. Andhra Pradesh
3. Tamil Nadu.

Each of the projects would be distinctive but all projects will share points of commonality. In addition, the concept of a “Virtual Centre” would use the internet and associated technology to take the impact of the programs across India. In each of the projects care has been taken to identify the appropriate “lead participant” from the India side and the Genesis India Horticultural Collaboration Project 2019 will work with these partners to create the strategic and business plan.

The Genesis “Four Collaborative Horticulture Groups”

1. **Maharashtra** – Aditya Birla Group – Horticulture Commission, Ministry of Agriculture and Farmers Welfare – Nashik Smart City – Jain Irrigation Services

Aditya Birla Group New Ventures and Yuva Mitra

The Aditya Birla group believe they need assistance with:

- Training
- Marketing
- Cultivation
- Cold storage

Yuva Mitra is a social development organization linked to the Aditya Birla Group, working in Sinnar Taluka of Nashik district for 17 years. Yuva Mitra is keen to collaborate on creating a Facilitation Centre which would also provide content and training. It is keen to support and deliver pilot projects which cover training, cultivation and technology. However, for this goal to be reached, it is envisaged that business support for such a project would be required.

In the Nashik area only 10-20% of farmers have irrigation, so a first step of collaboration might be to extend irrigation and introduce technologies in this area.

Horticulture Commission

The Horticulture Commission has a Centre of Excellence in Horticulture in every state (29 states) but as of now there is no Centre of Excellence dedicated to demonstrating hydroponic production and training relating to hydroponic growing – the commission wants to partner with Australia to add such a centre to at least one of its existing centres.

Jain Irrigation Services

Jain is keen to collaborate with Australia in the following areas:

- Training – Jain would be keen to develop a training program with Australia – providing good design for protected cropping and hydroponics, including train-the-trainer programs – both could be done via Jain.
- Hydroponics – design and training plus automation
- Urban Farming – the concept of growing within an urban area using hydroponic methodology to support intensive small-scale production of vegetables.

2. **Maharashtra** – Weikfield Pune Group. Pune Smart City, Farmogo and Chaitanya Agro Pvt Ltd.

Weikfield Pune Group

The Malhotra Weikfield Foundation is keen to develop a low cost hydroponic basic model which could be utilized on the small acreage plot and run by rural women. The intent here being that women farmers would grow vegetables and fruits, with Weikfield buying the produce and taking the same to market. Genesis has agreed as a CSR activity to design

a low-cost hydroponics kit for the foundation. This could then be followed on with the design of a suitable learning system –and some supporting train the trainer programs.

Farmogo

This group has started trials with kale, rosemary, mint, lettuce and coriander. They will soon grow capsicums and also use grow bags for varieties of vine crops. Longer term, strawberries and blueberries are possible. In their view an ideal project would be an India-Australia collaboration where products have “clean and green” credentials.

Chaitanya Agro Pvt Ltd

The business is looking to diversify from grapes into broader areas of food production including protected cropping and hydroponics. The company has land in both Nashik and Pune which could be used. Their concept is to first establish a demonstration project in protected cropping and hydroponics which would showcase the approaches and also become a centre for training. This would be best located with easy access to Pune.

3. Andhra Pradesh – Australia India Resources Mining Industry Group

Australia India Resources Mining Industry Group

Australia India Resources Ltd and the Australia India Rural Development Foundation are exploring ways to encourage agricultural innovation around their mine in Jonnagiri, AP, which would include use of recycled water for irrigation. A collaborative venture could be a vehicle for land purchase, a water treatment plant and a pilot hydroponics operation – a first for India.

4. Tamil Nadu – J Farm, Tractor and Farming Equipment Ltd, TN Horticulture Development Authority (TANHODA), Chennai Smart City.

J Farm, Tractor and Farming Equipment Ltd

J Farm (Research centre near Chennai) proposes a collaborative venture with simple infrastructure built for growing temperate and speciality vegetables like coloured bell pepper, broccoli, brussels sprouts, Training would be an important part of such a venture. As an associated activity, J Farm proposes a collaboration to grow asparagus, leek, kale, collard, turnip and fruits like strawberry at one of the TAFE owned Tea estates (Chamraj, Korakundah and Devebetta) in the highlands of Nilgiris district.

TN Horticulture Development Authority (TANHODA)

Tanhoda has 80 farms that operate over a total of 2,500 hectares. There is strong interest in any potential proposals that would ultimately lead to innovation/upgrade to these farms in protected cropping and hydroponics. In addition to this goal, the development of a demonstration and training centre for farmers would be viewed in a positive light.

Tanhoda wishes to explore an exchange system for farmers – between Tamil Nadu and Australia.

Executive Summary - General

One of the biggest historical shifts in rural India are the Farmer Product Companies (FPC) – the Government has set an aim for 10,000 of these collaborative ventures. An FPC is a grouping of at least 10 and up to 500 farmers into a collective including marketing. The Government will fund these FPC's and possibly farm subsidies will be distributed via them. Any Australian initiative in Controlled Cropping and Hydroponics needs to be relevant to this FPC sector.

“There is huge potential in monetising the number of farmers getting connected through FPO's. The FPO structure is currently in need of support services to enable them to secure business acumen and market linkages. Other key issues such as better insurance terms, quality assessment infrastructure, precision agriculture solutions for better crop management, access to finance, IoT based applications etc. needs to be addressed for the success of the FPO's”

Ajay Kakra, Director, PwC India

The six emerging trends shaping Indian agriculture are:

- rising food demand
- a shift in consumption patterns
- scarce natural and labour resources straining supply
- the potential to improve yields
- scope to cut wastage in the food chain
- technological disruption

To support these trends the key identified drivers for the Horticultural Industry in India are:

- Trust in food and horticulture
- Costs
- R&D and Innovation
- Infrastructure
- Sustainability – water and soil
- People and Future Labour
- Access to Capital
- Trade and Market Access

India has a major shortage of skilled trainers and leaders in the two areas of “Controlled Cropping” and “Hydroponics” – both of which shape as a key to the future

High-impact could, as previously mentioned, be achieved with an Indian-Australian Conference on Hydroponics and Controlled Cropping Innovations, which could have the right effect of educating and drawing the target market out – (this could be a project held in conjunction with peak organisations such as Protected Cropping Australia, and the Victorian Hydroponic Farmers Federation, and possibly supported by national or state government in Australia).

The concept of “stand alone” Centres of Excellence can appear and physically be isolated and seen as “foreign” rather than as relevant to India. For that reason, the Genesis India Horticultural Collaboration Project 2019 has developed a fully collaborative approach which provides Australia with a much more cost effective and high impact option of an Australian Centre of Horticulture Excellence within existing research or commercial locations.

Leading global practices in “Controlled Cropping” and “Hydroponics” need to be adapted and modified for the India situation, with experience showing that attempting to apply a western model to Indian horticulture has not led to great acceptance and change

To lead to introduction of more crops such as fruits and vegetables, as well as greater efficiency and knowledge exchange, the state of Tamil Nadu via TANHODA wants provision of greater knowledge on controlled cropping and hydroponics and would look favourably on an exchange system of farmers from both countries.

Technology innovation can effectively reach rural farming communities where most farmers have access to at least a mobile phone/smart phone device – which is why we believe a Virtual Centre of Horticulture Excellence should be part of an Australia India program.

Growing middle class and increased urbanisation are driving changing consumption patterns, including increasing demand for what have been regarded as “exotic” foods such as leafy greens, broccoli, blueberries and strawberries.

The middle class has increased interest in and some concerns about where their products come from, what are the farming practices, pesticides and fertilizer usage, land composition and more with growing concerns about health.

“Food trust helps reassure everybody your food is safe, healthy and good to eat. Therefore. It’s vital your systems and processes support that promise to sell safe food people can trust. It’s not just a statement, but a brand necessity.”

Clare Power Australasian Leader, Food Supply and Integrity Services, PwC Australia.

“The expectations of the modern Indian (and global) consumer are changing. Consumers expect more information about the provenance of their food and fibre. They are embracing new (increasingly digital) supply chain models which create a more direct connection to a product’s point of origin. They are also embracing new food sources — a trend which could force a dramatic reshaping of India’s production systems.” (Source KPMG)

Rural women can play a key role in horticulture innovation, as labour shortages and conservative practices are key factors in existing horticulture – strategies which involve and train women for this sector have a greater chance of success and thereby lift rural family incomes

Smart Cities across India are grappling with the issue of providing assured supply of energy, water and food to their growing populations. India has identified 100 of these cities. Smart Horticulture for Smart Cities has the potential to focus high interest on Australian innovations in design, creation, skills training and management services for controlled cropping and hydroponics.

The mining sector is well aware of a difficult relationship with agriculture and could be a leading player in horticulture innovation, bringing controlled cropping and hydroponics to those areas where mining is taking place. This could cover significant areas of rural land, approx. 100 km radius of mines

A fast-growing sector is “corporate farms” – large scale, well resourced, connected to market - creating increased demand for all aspects of Controlled Cropping and Hydroponics, and focused on a combination of the domestic market and exports

India has low productivity levels in irrigated agriculture - the overall efficiency of the system ranges between 25% - 40%. Water supply is also an issue to be considered, with over supply occurring during monsoon seasons, and if there is not enough capacity to store water, potential water shortage in the warmer months. A major positive shift would be to the use of modern systems of irrigation, which irrigates the plant rather than field and results in productive use of water. Systems such as Micro - irrigation, drip irrigation and computer-controlled application would appear to be key for enhanced water use and efficiency. Although the introduction of such technology would give more control to growers, the technology comes at a cost.

The Horticulture Commission, Ministry of Agriculture and Farmers Welfare, Government of India has at least one Centre of Excellence and Research in each of the 29 states of India. However, it is frustrated that there is no specialist Hydroponics Centre of Excellence in India and would be keen to be involved in such a centre.

India will move towards a modified form of Hydroponics, where conditions favour this horticulture - systems utilizing fertigation technology which has the capacity to increase the efficiency of fertilizer use and enhance the yield which in turn will increase the water productivity. The process of fertigation can potentially improve crop yields by 20 to 50% and economizes fertilizer use by 25%.

Jain Irrigation Systems Ltd are keen to work with the Genesis India Horticultural Collaboration Project 2019 to develop a proposal to work collaboratively in several areas:

- Training – Jain would be keen to develop a training program with Australia – providing good design for protected cropping and hydroponics, including train-the-trainer programs – both could be done via Jain.
- Hydroponics – design and training plus automation
- Urban Farming – how to do it, design, training and so on “Australian Urban Farmers”

Aditya Birla New Ventures team are presently incubating a start-up in the Agri Business space. They are connected with 10 farmer groups (ecosystem of 10,000+ farmers with majority small land holder farmers i.e. landholding less 5 acres). The supply base is located at strategic location (Nashik) which would serve major demand centers within India and exports hub. Currently serving major modern retailers and aggregators within country. They are looking for partnering with leading innovators, academic institutes/universities, research institutions, practitioners, impact investors in the Agri space across the globe to bring sustainable and scalable business opportunities to their “farm to fork” ecosystem.

E-commerce for food and fresh produce remains the exception rather than the norm in India and in most of the west. But India has been a fast adopter of e-commerce and clearly the horticulture sector needs to prepare for this additional path to market. In many countries e-commerce has already proven a significant disrupter to agricultural supply chains. Amazon Fresh has been well received in Europe, and players like Alibaba are doing well in Asia. E-commerce for food has globally provided a new path to market, new diets, fast-moving wellbeing trends, detailed providence information and sustainability. These new channels offer Indian producers the chance to move closer to their end customer and capture a larger price premium.

Agribusinesses are among the slowest organisations to adopt new digital technology despite the fact the entire agricultural industry revolves around data. From rainfall and a range of weather patterns, to the clockwork timing and precision of harvesting and distribution, the success of any modern agribusiness can be enhanced through effectively using an array of data sources. As technology becomes increasingly more prevalent, so do the types and number of data sources.

Asia is being transformed by the urbanisation and westernisation of the middle-class. There is a strong desire for the highest quality product, where provenance and safety are non-negotiable. Food safety scandals across Asian countries are driving this trend – the best-known being melamine contamination of milk powder in China in 2011, which has led to such strong demand for Australian-sourced product that consumers can now only buy two cartons per purchase in Australia. Consumers want to buy the food that Australians consume and that they can prove is made in Australia. ‘Brand Australia’ is strong.

“The agriculture sector is one of the last billion-dollar industries to be truly digitised. The Internet of Things (IoT) is a key enabler to unlocking this opportunity, and at the same time the challenge of on-farm connectivity is rapidly being solved.”

Piers Hogarth-Scott, National Lead Internet of Things, KPMG Digital Delta

“Digital technology and advanced analytics offer farmers new and exciting ways to achieve higher yields at a better quality, and with less waste and effort. Ultimately this translates to higher profits, happier customers, and a healthier environment. In today’s increasingly competitive global market, there has never been a better time for agribusinesses to take advantage of what digital technology coupled with advanced analytics have to offer.”

“There is a need to encourage varied and innovative systems to support access to capital that will facilitate Indian farm ownership and in turn generate growth through new value and increased volume.” Sources Robert Poole, Partner, National Lead Agribusiness – Management Consulting KPMG Australia and Anthony Coops, Partner, Innovation & Digital Solutions, KPMG Australia

The University of Melbourne has a long-term strategy for India engagement (“Engaging with India 2020-2024”) and seeks to prioritise collaborative partnerships with select agriculture universities and industry networks as well as explore the potential to develop a joint Institute of Agriculture. Source: Professor Muthupandian Ashokkumar, Assistant DVC International (India)

The University of Melbourne is also seeking to develop collaborations for integrated water management, leveraging its expertise and the Water, Environment and Agriculture Program which works with industry to drive innovation in water systems. Source: Professor Muthupandian Ashokkumar, Assistant DVC International (India)

Introduction

The Genesis Australia - India research project was made possible by a grant via the Australia – India Council 2019 International Relations Grants program.

The project team was been led by Tony Bundock and Stephen Manallack

Genesis Horticultural Solutions was founded by Tony Bundock, who has over 40 years' experience in the commercial horticulture sector. Tony is Deputy Chair of Protected Cropping Australia. Tony was employed as a senior educator with Chisholm Institute of TAFE for 23 years, and then worked for Powerplants Australia where he was the technical supervisor involved in planning hydroponic growing systems and training end users in hydroponic techniques.

In 2018 Tony formed Genesis Horticultural Solutions to devote more time to training and advising new entrants to the hydroponic crop growing industry. In 2018 he delivered a controlled horticulture/hydroponic cropping training program in India.

Stephen Manallack is the published author of four books and serves as a trainer, speaker and mentor on doing business with India, and leadership & communication, specialising in communicating across borders and cultures.

He is the former President of the Australia India Business Council (Victoria), the bilateral trade and investment organisation endorsed by both Governments – and led creation in Victoria of an Agribusiness Roundtable.

Stephen has led multiple trade missions to India. He is a blogger at <https://intoindia.blog/>

The project was undertaken between the 2nd of November and the 14th of November 2019

The overall aim of the project was to lead research into two-country collaboration, identifying suitable personnel to create a collaborative team of horticulture specialists, suppliers and educators/trainers in stage one towards a commercially viable Horticulture Centre of Excellence in India, providing training and train-the-trainer services – beginning with hydroponic and protected crop growing for the commercial vegetable industry.

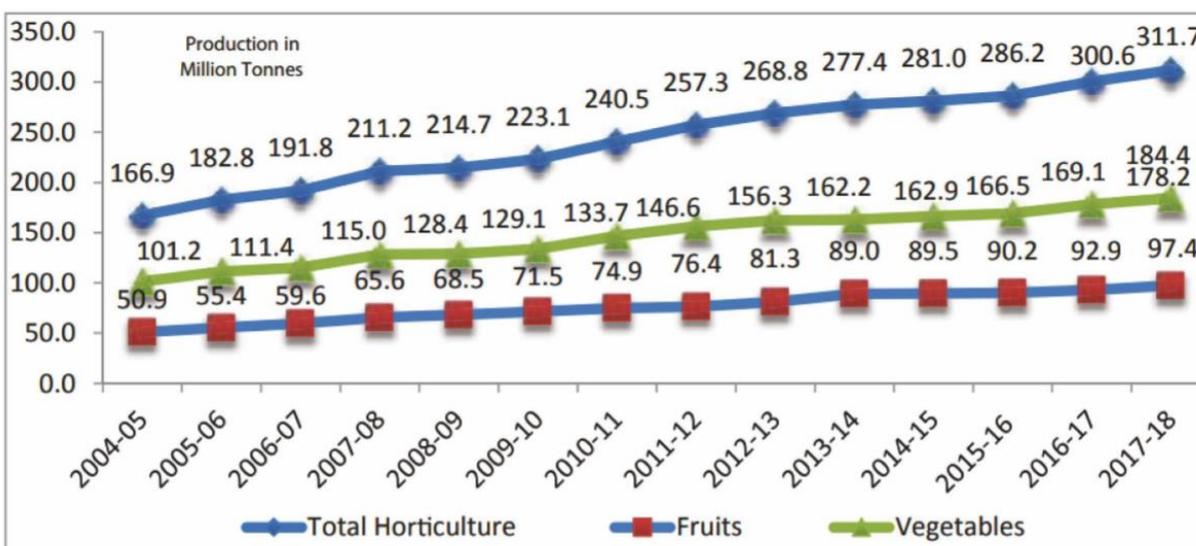
The Indian Agricultural Sector

Agriculture plays a vital role in India's economy with 54.6% of the total workforce engaged in agricultural and allied sector activities.

According to Goyal et al, in the 1960s, India embarked on an ambitious agricultural transformation. The use of high yielding seeds and fertilizers ushered in the “green revolution”— a new era of immense productivity and a crucial step in the newly independent country's journey towards food self-sufficiency.

Today, with minimal dependence on imports, the agriculture sector's contribution to GDP stands at USD 262 bn. With higher total return to shareholders than the Indian market, the Indian agribusiness companies have played a significant role in achieving this.

The total horticulture production in the country is estimated to be 313.85 million tonnes which is 0.69% higher than the horticulture production of 311.71 million tonnes in 2017-18. The area under horticulture crops has increased to 25.49 million hectares in 2018-19 from 25.43 million hectares in 2017-18.

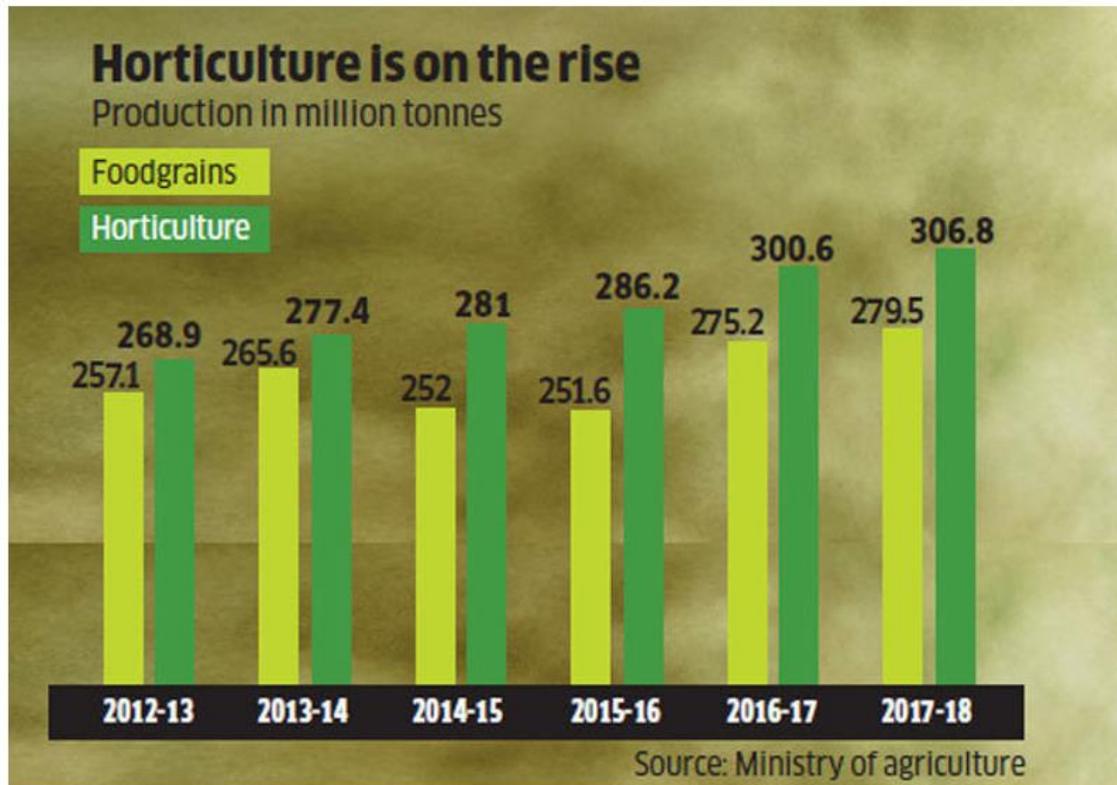


(Source Department of Agriculture, Cooperation and Farmers Welfare - Third Advanced Estimate 2018-19)

The Government of India has recently adopted a visionary goal of doubling farmer incomes by 2022.

The Government of India is also encouraging the biggest historical shifts in rural India via the Farmer Product Companies (FPC) – the Government has set an aim for 10,000 of these collaborative ventures. An FPC is a grouping of at least 10 and up to 500 farmers into a collective including marketing. The Government will fund these FPC's and possibly farm subsidies will be distributed via them.

Boosting farmer incomes has the capacity to infuse greater vitality into the sector overall. Agriculture companies and the government have the potential to work together to realize this dream, potentially unlocking around USD 175 bn of agriculture GDP and almost doubling farmers' income in the next 7 to 8 years.



(Source Indian Ministry of Agriculture, 2018)

The six emerging trends shaping Indian agriculture are:

- rising food demand
- a shift in consumption patterns
- scarce natural and labour resources straining supply
- the potential to improve yields
- scope to cut wastage in the food chain
- technological disruption.

Against this landscape, agriculture and related companies (e.g., equipment, financing, etc.) have the potential to focus on seven investible themes towards directly or indirectly enhancing farmer incomes:

1. Invest in food and vegetables and pulses value chain to meet demand.
2. Invest in the fast-growing cold chains and cold-storage markets.
3. Establish market linkages between farmers and buyers.
4. Unlock a large opportunity through digital and analytics.
5. Invest in ecosystem partnerships for disruptive solutions.
6. Enter the agriculture services market.
7. Offer agriculture financing and crop insurance to strengthen the ecosystem.

Recent trends are prompting an increasingly urgent question around the sustainability of value creation in the future. The extreme weather volatility, growing food demand and wide gap in productivity between India and its closest peers, and the need to manage food prices and import pulses to meet demand have all highlighted that India needs to rethink its approach.

Boosting farmer incomes in India

In a significant mindset shift, the Indian government's focus has moved from increasing farm output to improving farmer incomes – with Government having an aspiration to double farmers' incomes by 2022. The intent of this move would appear to be to enhance productivity and have multiplied effects on the larger ecosystem.

It is perceived that increased farmer incomes will:

- Foster the use of mechanized techniques to efficiently use stressed resources.
- Increase farmers' knowledge of the high productivity practices and high value product choices available to them.
- Help farmers to better navigate market inefficiencies rather than settling for lower prices set by the middlemen.

However, Indian farmers face multiple challenges, primary among these are excessive stress on land, water and soil health, lack of knowledge/information about high value/growth products, limited exposure to high productivity practices, weak market linkages, inefficient supply chains with high levels of food wastage and an acute dependence on rainfall.

Availability of water in India

According to Malhotra and Manish Das (2016), the conventional system of irrigation in Indian Agriculture/Horticulture, i.e. flooding, furrow, bedding, border irrigation revolves round the concept of replenishing the moisture level to field capacity (FC) after 50% to 60% depletion.

These systems do not permit the restricting of water to meet the requirement at the root zone, thus leading to excessive percolation and other losses, which results in problems of water logging, soil salinity and even drought like conditions within these systems.

As a result, these conditions have created the low productivity levels in irrigated agriculture as well. The overall efficiency of the system ranges between 25% - 40%.

Water supply is also an issue to be considered, with over supply occurring during monsoon seasons, and if there is not enough capacity to store water, potential water shortage in the warmer months.

To meet the food security, income and nutritional needs of the projected population in 2020, the additional requirement of food grains (including pulses), fruits and vegetables have to come from limited land and declining water resources. This will ultimately

necessitate the use of modern system of irrigation, which irrigates the plant rather than field and results in productive use of water.

Systems such as Micro-irrigation, drip irrigation and computer controlled application would appear to be key for enhanced water use and efficiency. Although the introduction of such technology would give more control to growers, the technology comes at a cost.

A further consideration for enhanced productivity would be to develop hydroponic systems utilizing fertigation technology which has the capacity to increase the efficiency of fertilizer use and enhance the yield which in turn will increase the water productivity. The process of fertigation can potentially improve crop yields by 20 to 50% and economizes fertilizer use by 25%. According to Malhotra and Manish Das (2016), the fertilizer use can be further economized by differential use of fertilizer during different stages of plant growth instead of applying it in equal splits during crop growth period.

Understanding of hydroponic terminology in the Indian market

Pure hydroponic growing is defined as a method of growing plants in an inert medium and fed with a nutrient solution. The nutrient solution involves blending fresh water with a concentrated nutrient solution, that contains all the elements the plant needs for healthy growth. The composition of the nutrient solution can be modified to encourage either vegetative growth or generative growth (fruiting) in vegetables.

The ready availability of the nutrient solutions allows the plants to take as much or as little nutrient from the solution as it requires.

The project team observed a terminology being used in India of 'Modified hydroponics' which could also be seen as a process of 'drip irrigation' utilizing fresh non fertilized water being applied through emitters to pots and soil based growing media.

The range of farms in India

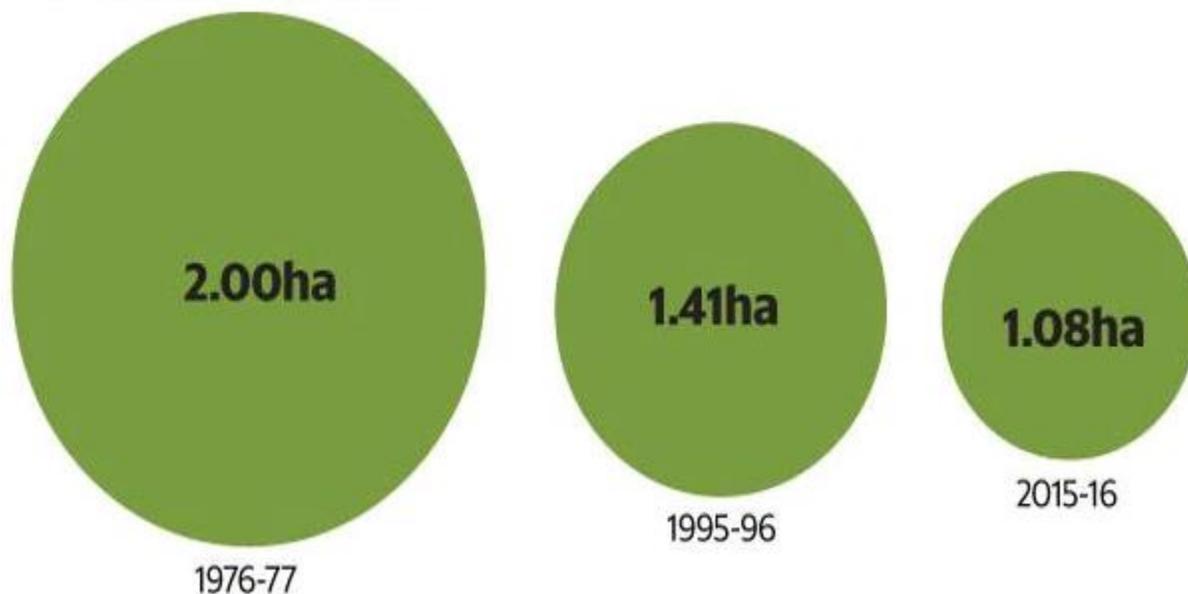
According to Mukherjee (2019) the average size of the Indian farmland shrank by over six per cent between 2010-11 and 2015-16, with operational holding in the country dropping to 1.08 hectares from 1.15 hectares in 2010-11.

With land holding getting smaller, the share of small and marginal holdings in India, (between zero and two hectares) has risen to 86.21 per cent of total operational holding in 2015-16, which comes to around 126 million, as against 84.97 per cent in 2010-11.

Conversely, the share of semi-medium and medium operational holdings (2-10 hectares) in total land holdings dropped from 14.29 per cent to 13.22 per cent, while that of large holding (10 hectares and above) fell from 0.71 per cent in 2010-11 to 0.57 per cent in 2015-16.

India's shrinking farms

Average farm size (in hectares)



(Agricultural Census of India, Indira Gandhi Institute of Development Research)

This also means the number of small holdings within India has grown in five years, due to fragmentation of land, while that of medium and large holdings have gone down.

Operational holding has been defined as all land used wholly or partly for agricultural production and is operated as one technical unit by one person alone or with others, without regard to title, legal form, size or location.

Total operated area, which includes both cultivated and uncultivated, provided part of it is put to farm use, fell from 159.59 million hectares in 2010-11 to 157.14 million hectares in 2015-16.

According to an official statement, the percentage share of female operational holders increased from 12.79 per cent in 2010-11 in total holdings to 13.87 per cent in 2015-16 while the corresponding figures of 10.36 per cent and 11.57 per cent in the operated area.

“This shows that more and more females are participating in the management and operation of agricultural lands,” the statement said.

The highest number of operational holders belonged to UP -- out of the 146 million, around 23.82 million was in UP, followed by Bihar (16.41 million), Maharashtra, Madhya Pradesh and Karnataka.

Initial travel and meeting itinerary for program

Depart Melbourne Saturday 2nd November

Melbourne to Singapore - Singapore Airlines Flight SQ218 – Depart 01:05am

Singapore to Chennai – SilkAir Flight MAA Depart 07:00am

Arrive Chennai 08:50am

Sunday 3 November

1. Site visit to J Farm research centre, Tractors and Farm Equipment Limited,
Pudupakkam,
Kelambakkam

Contact - Dr. K. Srinivasan Chief Scientist

Monday 4 November

2. Site visit to Indo-Australia Chamber of Commerce
'Nawazish', 4th floor, Old No. 17, New No. 30, Khader Nawaz Khan Road
Nungambakkam, Chennai – 600 006

Contact Petula Thomas, Director.

3. Site visit to Tamil Nadu Department of Horticulture
3rd Floor, Agriculture complex,
Ezhilagam,
Chepauk,
Chennai,
Tamil Nadu 600005

Contact - Dr.N.Subbaiyan – Director

4. Presentation to Public Relations Society of India,
Hotel Savera
Chennai

Tuesday 5 November

Depart Chennai Tuesday 5th November

Chennai to Bengaluru - Air India flight AI 0563 – Depart 2:20 PM

Arrive Bengaluru 3:20 PM

Wednesday 6 November

5. Meeting at hotel with Australian Indian Rural Development Foundation
Contacts - Dr Parinitha Mahishi, and Dr Stuart Newton
6. Meeting at hotel with Australian Indian Resources Ltd.
Contact - Charles Devenish, Chairman
7. Meeting at hotel with ProActive Agri Solutions Pvt Ltd
Contact - Sachin Kulkarni
8. Meeting at hotel with independent Horticultural Consultant
Contact – Anil Patil
9. Meeting at hotel with Victorian Government representative
Contact - Gopi Shankar

Thursday 7 November

Depart Bengaluru Thursday 7th November

Bengaluru to Mumbai - Air India flight AI 0604 – Depart 8:50am

Arrive Mumbai 10:40 AM

Mumbai 7-9 November

10. Presentation to Mirum group
Contact - Mr Hareesh Tribewala

Friday 8 November

11. Meeting at hotel with Victorian State Government – Senior manager – Trade
South Asia
Contact – Abhishek Padwal
12. Meeting at hotel with Adfactors PR Pvc Ltd
Contacts – Prashant Iyer and
13. Meeting at Aditya Birla Group offices
Mahakali Caves Road,
Andheri East,
Mumbai,
Maharashtra 400093
Contact - Shirang Sirsikar
14. Meeting at hotel with Weikfield Products Ltd
Contact – Mukesh Malhotra

15. Meeting at hotel with Mirum Group
Contact – Hareesh Tibrewala

Saturday 9 November

16. Meeting at hotel with Jain Irrigation
Contact – Dr. Sangeeta Ladha

Sunday 10 November

Depart Mumbai Sunday 10th November

Mumbai to New Delhi - Air India flight AI 0348 – Depart 8:15am
Arrive New Delhi 10:30 AM

Monday 11 November

17. Meeting at hotel with Cravo group
Contacts – Rajender Kumar and Shashank Jain
18. Meeting with Trade Promotion Council of India
2nd Floor, Scindia House
Connaught Circus
Contact - Nupur Kumaria

Tuesday 12 November

19. Meeting at hotel with VAS Agri Pvt Ltd / Junga FreshnGreen
Contacts – Sandiip Bhatia,
20. Meeting with Counsellor Agriculture, Australian High Commission
Contact – John Southwell

Wednesday 13 November

Depart New Delhi Wednesday 13th November

New Delhi to Melbourne - Air India flight AI 308– Depart 1:55pm
Arrive Melbourne 08.00 AM (Thursday)

Interview reporting and findings

J Farm Research Centre – Tractor and Farm Equipment Ltd

Introduction: TAFE – Tractors and Farm Equipment Limited, is an Indian tractor major incorporated in 1960 at Chennai, with an annual turnover of INR 93 billion (the third largest in the world and the second largest in India by volumes, TAFE dominates the Indian tractor industry with a sale of over 150,000 tractors (domestic and international) annually. TAFE's partnership with AGCO Corporation and the Massey Ferguson brand for over 55 years is an example of its commitment to building long through fair and ethical business practices.

J Farm Services is an initiative by TAFE (Tractors and Farm Equipment Limited), a leading private agriculture research and training centre. It aims to increase easy access to farm mechanization solutions through rental of tractors and farm equipment for small and large farms. Small and marginal farmers, who hold more than 80% of the land holdings in India may not be able to afford ownership of tractors or implements. J Farm Services bridges this gap by connecting these farmers with tractor and equipment owners through its Farmer-2-Farmer platform. Farmers can explore and book nearby equipment through a mobile app:



This free app connects tractor owners and Custom Hiring Centres (CHCs) operated by tractors and equipment owners directly to farmers seeking farm mechanization solutions, thereby facilitating a fair and transparent rental process while focusing on quality, dependability and timely delivery. J Farm Services offers the farmers and renters a wide range of prospects for hiring and renting of farm equipment and connects them directly to negotiate and fulfil their respective requirement.

With the creation of this platform comprising farm machinery owners and users, J Farm Services has impacted the lives of over 85,000 farmers across 10 states in India since its inception in 2017.

Interview with Dr. K. Srinivasan Chief Scientist and staff



Left to right – J Farm staff members X 2, Stephen Manallack, Dr. K. Srinivasan, J Farm staff member, Tony Bundock, J Farm staff members X 2



Site inspection of J Farm

Detail:

J Farm has developed a method of cultivation which it calls “Modified Hydroponics”, suitable to tropical and sub-tropical climates. The farm grows tomatoes, chillies, aubergines, bush beans, snake gourd, ridge gourd, bitter gourd and leafy vegetables. The scheme operates in open fields and uses an organic media in plastic troughs or various sizes of UV treated bags. Irrigation is applied automatically via drop or micro sprinkler and is gravity fed. The centre has achieved increases in yield and reductions in pests and diseases.



Example of modified hydroponics at J Farm

J Farm has demonstrated water use reductions as high as 90% compared to traditional methods, plus decreases in the vegetative growth time and prolonging the productive crop duration. Crops are grown free of chemical fertilisers and pesticides.

J Farm believes that the western model of hydroponics (as from Israel and Holland) is not appropriate for the tropical and sub-tropical climate and far too expensive for most farmers.

The next step for J Farm is a large-scale confirmatory trial to standardise on nutrients in the media for the transfer of technology.

J Farm proposes a collaborative venture with simple infrastructure built for growing temperate and speciality vegetables like coloured bell pepper, broccoli, brussels sprouts,

asparagus, leek, kale, collard, turnip and fruits like strawberry at one of the TAFE owned Tea estates (Chamraj, Korakundah and Devebetta) in the highlands of Nilgiris district.

The results of their pilot study indicated that cost of cultivation is reduced by 30-40% as the intercultural operation is absent. Automation of irrigation resulted in reduction of manual work. Water conservation was the biggest advantage since Cocopeat in the medium absorbed a great volume of water and slowly released to the plants. This technology saved an incredible amount of water. It used as little as 1/20th the amount used in conventional farming. This technology is seen as being 'female' friendly and helped to bridge the gender gap and increased productivity.

The next stage is for large scale confirmatory trial and to standardise the process involved in the choice of nutrients in the media for the transfer of improved technology is as follows:

1. Exploring the possibility of using different dimension of plastic trough and UV treated bags as per plant architecture
2. Refinement and estimation of nutrient content for the growing media (Composition of vermicompost obtained from using animal manure & press mud, fully digested poultry manure, biochar and red soil, clay pellets fortified with biofertilizers and biofungicides, cocopeat etc)
3. Using of different concentrations of water extract of Neem (*Azadirachta indica*) Seed Kernel (NSKE) and Pongamia seed (*Pongamia glabra*) to manage the insect pests
4. Effect of seed treatment (with inorganic and organic nano material) on the germination, vegetative growth and yield of crop
5. Automation of drip irrigation system under bio-mulch as per the requirements of crop
6. Assessment of yield and profitability as compared to conventional cultivation practices
7. Simultaneous on farm training to be imparted to researchers, trainers (extension functionaries), growers and entrepreneurs.

J Farm believe that this technology can also improve the livelihood of millions of poor farmers and contribute to the nutritional security of people in rest of the Indian states and in eastern, western and central Africa.

Through their networks, Tractors and Farm Equipment Limited believe they can create an awareness of this technology to millions of small land holding (0.5-2.0 ha) farmers through their vast dealership network spread all over India and in many African countries.

The aim of the venture is to improve the livelihood of marginal and small farmers through introduction of low-cost advanced production technology for growing tropical vegetables.

J Farm have supplied a proposal for development of their concepts and can be viewed at Attachment 1

Indo-Australia Chamber of Commerce

Introduction: The Indo-Australian Chamber of Commerce brings together over 500 companies to emerge as the single most premier platform for trade promotion between India and Australia. The Chamber was established on a vision of two former Prime Ministers – Mr. Bob Hawke, Prime Minister of Australia and Mr. Rajiv Gandhi, Prime Minister of India signed a Charter at Canberra in 1986, proposing to form the two institutions – the Indo-Australian Chamber of Commerce and the Indo-Australian Joint Business Council. The Chamber was formally inaugurated on 22nd June, 1989 by His Excellency Mr. G.B. Feakes, A.O., the then High Commissioner of Australia in India, is the only organization in the country promoting bilateral trade and investment between India and Australia.

With over 500 members, the Chamber now represents almost the entire range of Indo-Australian business community. These 500 members include, leading Australian and Indian companies doing business across and between the two countries. A major feature of the Indo-Australian story is the large number of Small and Medium Enterprises that have moved from Australia to India and set up business here. The Chamber has been playing a 'hand-holding' role in helping them to set up their business in India and find their feet in the market here. The Chamber has in the past 28 years, led sixteen Business Missions to Australia and has helped over 400 Indian companies, mostly SMEs, to establish long term business relations and effective partnerships with Australian companies.

Interview with Petula Thomas, Director, Indo-Australia Chamber of Commerce



Left to right - Tony Bundock, Stephen Manallack and Petula Thomas

Detail:

Following discussion with Petula Thomas around the aims of the project, the Indo-Australia Chamber of Commerce will look at placing the Genesis India Horticultural Collaboration Project 2019 report or a link to the chamber website – and hosting any roadshow or promotional event in the future.

Stephen Manallack has INTO INDIA blogs already posted in the chamber's website and the chamber has invited him to write a blog summarising the report for their website.

The concept of the Chamber approaching Tamil Nadu Government to collaborate on a trade mission to Australia at the time of the release of the report received a positive response.

Genesis Horticulture Solutions has also agreed to join IACC as a member.

Tamil Nadu Department of Horticulture

Introduction:

Tamil Nadu Horticulture Development Agency was formed on the 18th of June 2004 and was registered as a Society under Tamil Nadu Societies Registration Act, 1975. It was conceived as a Special Purpose Vehicle for the purpose of implementing centrally sponsored schemes.

TANHODA has provided much needed operational and financial flexibility for implementing schemes. Fund flows have become faster, the pace of implementation has picked up and schemes have seen steady progress. TANHODA now is the nodal agency for Mission for Integrated Development of Horticulture (MIDH) - National Horticulture Mission (NHM), Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) "Per Drop More Crop", Tamil Nadu Irrigated Agriculture Modernization Project (TN-IAMP), National Agro Forestry and Bamboo Mission, National Ayush Mission- Medicinal plants.

Besides the schemes, there are 63 State Horticulture Farms and 19 Parks and gardens under the control of TANHODA.

The Financial approval for the Farms is approved by the Governing council, headed by the Agriculture Production Commissioner/ Director/ Commissioner of Horticulture as Managing Director. The other members are the heads of Departments - The Director of Agriculture, Additional Secretary to Government Finance Department, The Commissioner of Agricultural Marketing and Agri Business, The Chief Engineer, Agricultural Engineering Department, The Director, Rural Development and Panchayat Raj Department, and The Dean (Horticulture) Tamil Nadu Agriculture University.

Interview with Dr Subbaiyan, Director, TN Horticultural Development Authority (TANHODA)

Detail:

Dr Subbaiyan revealed that Tanhoda has 80 farms that operate over a total of 2,500 hectares. There is strong interest in any potential proposals that would ultimately lead to any form of upgrade to these farms. In addition to this goal, the development of a more focussed demonstration and training centre for farmers would be viewed in a positive light.

As an organisation, TANHODA wants to encourage more growing of vegetables and fruits in the Tamil Nadu region. There is a view that to develop this industry there would be a need to include some form of retractable roofing/protected cropping and an elevated adoption of hydroponic growing, but concern was expressed about the cost of the technology.

In order to encourage this development, the suggestion was made for the development of a proposal for an exchange system for farmers – between Tamil Nadu and Australia.

Mention was made to the fact that within the Indian agriculture sector there was not a lot of knowledge about the detail of hydroponics and as such training in initial understanding of the process would be required for new entrants.

It was highlighted that the Indian Government placed importance on rural women's projects and that some small-scale form of hydroponics would be of interest in conjunction with a cooperative, leading to local production for local sale

Public Relations Society of India

Introduction:

Public Relations Society of India (PRSI), the national association of PR practitioners was established in 1958 to promote the recognition of public relations as a profession and to formulate and interpret to the public the objectives and the potentialities of public relations as a strategic management function.

The members of the society are public relations practitioners from Multinationals, Government, Public and Private sector, Academics and PR consultants.

Delivery of presentation to the Public Relations Society of India



Pictured Stephen Manallack

Detail:

Project member Stephen Manallack presented to the group on the overall purpose and activity of the Genesis India Horticultural Collaboration Project 2019, and also detailed how he saw global communication expanding in the future. Stephen also highlighted how the Millennial population of India may well hold the key to future industry development.

The presentation also gave rise to an opportunity for networking with local industry identities who would be keen to assist in future developments.

Aus. Indian Rural Development Foundation & Australian Indian Resources Ltd.

Introduction:

The Australian Indian Rural Development Foundation is a Non-govt company, incorporated on 24 Nov 2008. It's a private unlisted company and is classified as 'company limited by guarantee'.

Australian Indian Rural Development Foundation is majorly in Community, personal & Social Services business from last 11 years and currently, company operations are active. Current board members & directors are Narayanswamy Vasudev, Charles Devenish, Tushar Gandhi, Jade Devenish and John Devenish.

Australian Indian Resources Ltd (AIR) was incorporated in 1994 by a group of Australian investors/shareholders who could foresee an opportunity to participate in the development of India's mineral potential when the Indian government took a landmark decision to open up the mineral exploration sector for foreign investments. AIR acquired 100% stake in Geomysore Services (India) Private Limited (GMSI). GMSI and other subsidiary companies of AIR have been carrying out exploration for Gold, Base metals, Nickel, Platinum Group Elements (PGE) in various parts of India.

Interview with Australia Indian Rural Development Foundation and Australian Indian Resources Ltd



Left to right – Tony Bundock, Charles Devenish, Stephen Manallack, Dr Parinitha Mahishi and seated - Dr Stuart Newton

Detail:

Charles Devenish is the only international miner in India and has a mine in Jonnagiri.

Charles highlighted that in his view, India is trying to keep young people in the villages and rural areas because of the massive pressure on cities. However, the challenge for India is how to provide an appropriate level of interest and wage-earning capacity that will attract younger Indians to stay in the village communities?

Charles was of the opinion that mining and agriculture can provide a model for innovation – by means of developing agriculture/horticulture production around the perimeter of mines (approx. 100 km radius around the mine) – and utilising funding from the mine and thereby help local farmers with training and the adoption of technology based methods of production. It was suggested discussion should be sought with FIMI in Delhi – contact being a Mr Sharma. Charles felt confident that the Indian mining industry would support such an initiative with substantial finances. He felt we could create horticulture collaboration via links with the miners in India. Jain irrigation were also seen as potential partners and a meeting with Jain forms part of the project itinerary. Several other potential partners were also identified during the conversations.

Reference was also made to the ideal of enlisting the support of rural women by providing specific horticulture projects which women could derive incomes from. Charles suggested that the project should look at creating a “box of products” across low level and high level horticulture.

Another issue that Charles was passionate about was the problem of iron deficiency in the general population which he believed is due to alkaline soils. This was a discussion point and the resolve could potentially be seen if plants were grown hydroponically with controlled levels of nutrient and pH in the nutrient solution.

Since the interview time, Charles Devenish has submitted an idea to the Genesis team looking at recycling water in villages adjacent to mining communities. The technology referred to is Canadian and is generally seen as a world leader in this field. Charles’s team have just secured the first tranche of money for the purchasing of all the important land for their Jonnagiri gold project, and hence the reason he is interested to look at this whole issue of village waste and water recovery.

The intent for consideration and discussion, is to see if the team could bring together 3 Governments, (Australian, Canadian and Dutch) to invest into what could be a unique first for India. This would include land purchase, a water treatment plant and a pilot hydroponics operation. The Jonnagiri mine sits between both Hyderabad and Bangalore, so the potential market is huge for quality vegetable production. The scale of this market is huge embracing potentially 150 million small farms, along with a range of micro-climates and 700,000 villages. The intent of the project is to be sustainable and financially sound, with the intent of replicating it but using the mine as the launching pad.

Full details of the project are listed as Attachment 2.

ProActive Agri Solutions Pvt Ltd

Introduction:

ProActive Agri Solutions is a private company run by agronomy consultant Sachin Kulkarni. The company provides advice in the areas of Crop Nutrient Management /Fertigation consultancy, Training is also provided to individuals and organisations in the areas of Soil and Soilless Cultivation, as well as Corporate Employee and Dealer Training for companies engaging in Agri Inputs marketing, Seed Production, Protected & Open Field cultivation

Interview with Sachin Kulkarni



Left to right – Tony Bundock, Sachin Kulkarni, and Stephen Manallack

Detail:

Sachin was quick to point out that in his opinion (and one shared by the Genesis team) greenhouses work best in the dryer climate of north India but not so well in the hot and humid south. In the south the retractable roof system could be best suited to vegetable growing – and such a structure would provide shade on hottest days and protect crops from heavy rain and generally inclement weather. This type of structure would certainly be of interest to the larger of the small farms, and as such would provide a target for improvements – but these systems would be too expensive for the smaller growers.

Sachin also highlighted that any automation would need to adapt for inconsistent power supply – for example use of solar and/or generator would need to be onsite to overcome the potential of power loss that seems to be a frequent issue in India.

For the implementation of commercial hydroponic systems, consideration of water sources would also need to be identified for crop usage. Indian water sources are primarily open wells and ground water – with a limited number of dams and only a small amount of bore water is currently accessed. Coupled with this is the fact that the central part of India is dry – so it is inherently difficult to farm.

Sachin held the view that Hydroponics could be useful in the times of the monsoons when there are shortages of most vegetables. But whilst the theory is sound, the issue of a lack of knowledge about hydroponic growing is a very real boundary to the expansion of the industry. It would seem that currently very few Indian growers have the skill base to conduct hydroponic growing, and a large majority of consultants in India also lack the practical skills and knowledge to advise new entrants into hydroponic growing. It certainly appears that there is an appetite in India for hydroponic growing, but the industry development is being hindered by the lack of practical ‘hands on’ knowledge and experience.

Target for hydroponics should be the middle class and mid-level farmers. Key would be to have a “one stop shop” on hydroponics that can be adapted to small while also scalable to large. His view is that there should be a hydroponics education campaign followed by offering of “one stop shop” solution, with the larger suppliers (Cravo etc) looking to fund this stage of a campaign.

Another consideration raised by Sachin was the concept of an Indian-Australian Conference on Hydroponics which could have the right effect of educating and drawing the target market out – (this could be a project held in conjunction with Australia’s Protected Cropping Australia and the Victorian Hydroponics Farmers Federation and possibly supported by national or state government in Australia. The forum could also be a potentially suitable platform to launch the findings of the Genesis project - ideal locations were targeted as either in Mumbai, Hyderabad or Bengaluru.

However, Sachin was clear in his thoughts that whatever the final solution/outcome, it would be important to have an “Indian aspect” rather than be seen as just ‘dumping’ a western solution into Indian conditions.

Another potential partner in the project could be the Bayer company who currently operate in India.

Independent Horticultural Consultant – Anil Patil

Introduction:

Anil Patil is an independent Agricultural project and management consultant who has been operating in the Indian market across the past 40 years. Anil consults to both Government and private organizations in all aspects of high-tech agricultural projects.

Interview with Anil Patil



Left to right – Tony Bundock, Anil Patil, and Stephen Manallack

Detail:

Anil is a firm believer that the way to accelerate horticultural production and technologies is with the support of the industry key players such as Cravo and Priva as examples. In his opinion the traditional family farms in India are no longer viable in their current state and format – the way forward would need to see larger farms and cooperatives that amalgamate the family farms. Although not confirmed, Anil believes that there would be Indian Government funding for this option.

In relation to crop types that are suited to Indian hydroponic growing, Anil holds the view that India grows plenty of strawberries, capsicums and tomatoes – but that high value crops such as blackberries and blueberries are in short supply. Coupled with the fact that in the hot season, crops such as tomatoes, capsicums and blueberries come into short supply, so this is an opportunity to look at cultivating crops that can be grown in systems that ensure supply at these times.

While export is attractive the channels for export are not that good and Anil would be interested in seeing if the Genesis project could ultimately create a “pathway for export” that producers could utilize.

In terms of marketing, Anil was quick to point out that any large scale Horticulture production should also be linked to a processing plant – so that when products like tomatoes or strawberries are in over-supply they can be processed – at the moment they are thrown out which leads to wastage and also keeps prices suppressed in the marketplace.

In his opinion, Anil believes that the overall industry has an urgent need for training. However, training at existing Indian research centres is not seen as a preferred option, as the centres seem to have a desire to take control of the training content. With this in mind the suggestion was made that any training should be at the location chosen by training provider, and ideally utilizing the resources at a commercial centre.

In terms of an independent organisation making investment into land and property to own an independent training facility, it should be noted that Foreign Direct Investment (FDI) direct into India is not permitted into land ownership for farming – so any FDI would need to be via a local Indian company that can then invest in the land. This would be a holding company and the producing company returns money to the holding company. The suggestion was made that the project could ultimately look at creating a model for consolidation of small farms and use that model to attract investors.

Anil holds a vision for the creation of a large-scale commercial horticulture centre that could also be utilized as a training centre – within this model he believes that students would pay high fees to come for 6-12 months and could work as labourers on the farm while training. At the end of the training period, this would see graduates being ‘job ready.’

The scope of Anil’s vision is wider than just India, and he foresees that graduates could work in India, Dubai and Muscat. In terms of budget he believes students would pay R1lakh (100,000) per month and each course could accommodate 25 students at around R2.5 million per month = A\$55,000. An Indian bank could provide the finance for the students. This system would need an Australian certificate.

In summary, Anil recommends an Australian legal setup in India, creating an independent commercial and training centre that also acquires land – and it is his belief that commercial companies would want to be involved.

To support this ideal, Anil prepared a project proposal which is listed as Attachment 3 in this report.

Victorian Government representatives

Michelle Wade, Commissioner – South Asia, Global Victoria – Bangalore
Gopi Shankar, Trade and Investment Director, Victorian Government Business Office, Bengaluru

Introduction:

The Victorian Government Business Office, Bengaluru, is part of Global Victoria, Government of Victoria.

Strong cultural ties and people-to-people links underpin Victoria's expanding relationship with India, the second most populous country in the world and an emerging economic superpower.

To support the state's engagement with India, the Victorian Government established Victorian Government Trade and Investment (VGTI) in Bengaluru in 2005 and Mumbai in 2012. These offices play a vital role in the facilitation of trade and investment and help to develop stronger people-to-people links and institutional ties.

India is one of Victoria's primary sources for international students and is one of the state's fastest-growing sources of international tourists. India is also an important market for Victorian food and fibre products and is emerging as an important market for urban design, ICT and life sciences.

Cultural ties and people-to-people links between Victoria and India are extensive and continue to strengthen as a result of events such as the Indian Film Festival of Melbourne and the Diwali (Indian Festival of Light). Unveiled by the Victorian Government on 14 January 2018, Victoria's India Strategy: Our shared future is an ambitious blueprint to further strengthen Victoria's engagement with India.

Interview with Michelle Wade:



Pictured is Michelle Wade, Commissioner – South Asia, Global Victoria – Bangalore

Michelle introduced the team to Sidharth Charkha, Founder and CEO of Farmogo, with a focus on exotic fruits and vegetable production.

There are significant opportunities for collaboration with his project. See Farmogo interview in later section.

Interview with Gopi Shankar:



Pictured is Gopi Shankar, Trade and Investment Director, Victorian Government Business Office, Bengaluru

Gopi recommended a stronger emphasis in this program on Maharashtra which “is India’s horticulture state”. Nagpur oranges, or Mahabaleshwar strawberries or of course the famous Alfonso mangos from Ratnagiri, Maharashtra boasts of a strong horticulture sector. He advised it would be good for the program to connect with the Nashik – Pune region and more specifically the Mahratta Chamber of Commerce, Industry and Agriculture (MCCIA) in Pune (this meeting took place with Mr Malhotra)

He suggested we meet with the Aditya Birla Group in Mumbai – Shrirang Sirsikar (this meeting took place and detailed in this report).

Gopi provided an outline of trends and changes in agribusiness as well as changing food demand from the growing middle-class market – as seen in supermarkets, restaurants and hotels.

Victorian State Government and Adfactors PR Pvc Ltd

Introduction:

Adactors PR, is a multi-specialist, full-service firm, who serve over 300 retained clients across forty cities in India. The clients include some of the largest corporations, conglomerates, financial institutions and governments, as well as a host of bright, young start-ups and unicorns.

Adfactors PR have a track-record of successfully delivering on complex and challenging PR briefs – often characterised by high stakes, urgency and a sense of uncertainty about the potential outcomes. In a complex world with trust deficit, they believe public relations is 90 per cent behaviour and 10 per cent communications. They believe relationships are key to sustainable business and integrity, while transparency, purpose and fairness are critical elements of a successful public relations programme. As a firm, Adfactors practice what they preach. Culture is their strength and culture, and is built on simple tenets of integrity, transparency, fairness and simplicity. Constant, incremental innovation for creating value for our clients is also a part of the value system. The few businesses Adfactors do not work for include: Tobacco, alcohol, meat-processing and gambling. In recent years, Adfactors PR has won multiple accolades, including PR Awards Asia's (formerly PRWeek) South Asia Agency of the Year for four consecutive years – 2018, 2017, 2016 and 2015.

Victorian State Government. Although obviously based in Australia, the Victorian State Government has an increased presence in India, and ultimately has a goal for the state of Victoria to be a valued knowledge and business partner to India.

As part of this goal the VIC state government has developed a strategy in collaboration with our Indian government and industry partners. The directions in this 10-year strategy are about strengthening the relationship based on:

- equal exchange
- meaningful engagement
- personal connections
- a long-term commitment to the relationship.

The Government are also committed to building a close relationship with India to

- increase goods exports to India from an annual average of AU\$500 million over the last five years to almost AU\$1 billion
- increase the number of Indian postgraduate research students in Victoria by 25%
- double the number of Victorian businesses engaged in India from 150 to 300
- grow expenditure by Indian visitors to Victoria from AU\$367 million to AU\$885 million

Interview with Victorian State Government and Adfactors PR Pvc Ltd



Pictured are (from left) Stephen Manallack, Bharat Joshi, AdFactors Australia, Tony Bundock, Abhishek Padwal, VGBO, and Prashant Iyer, AdFactors India

Detail:

At the meeting the following two identities were representing their respective organizations.

Prashant Iyer - who is the President of AdFactors PR and responsible for India Market Entry

Abhishek Padwal – who is the Senior Trade manager for Global Victoria (Victorian Government)

Abhishek mentioned IG Group as being interested in growing blueberries.

Although not directly involved in the horticultural marketplace, both visitors suggested the northeastern states of India as high potential. These states have a dryer climate that would be more suited to protected cropping. – seven states – the seven sisters, including Arunachal Pradesh, Assam, Meghalaya, Manipur, Mizoram, Nagaland and Tripura prior to inclusion of Sikkim.

As a company, AdFactors is very active in this region, and has good working linkage within the region.

Discussion was also held about the potential for the introduction of organic farming. There would appear to be a high demand for organic produce but currently there is uncertainty about the validity of requirements required to give produce organic validation.

The meeting also provided further contacts for ongoing discussion. This included United Phosphorous – and Abhishek has a contact within the company. Another potential contact identified was UPL Limited, formerly United Phosphorus Limited. This is an Indian

multinational company that manufactures and markets agrochemicals, industrial chemicals, chemical intermediates, and specialty chemicals, and also offers crop protection solutions.

A further identity also joined the meeting - Balakrishnan Yadav, Jain Irrigation Systems Ltd

Jain is also a horticulture producer and ranks number 2 or 3 in India for vegetable and fruit.

Key concerns from Jain are seen as:

1. Logistics – losses as high as 20-15% occur
2. Productivity – is low - need some way to increase
3. Training of farmers – short supply and would interest them
4. Hydroponics

Balayrishnan explained that the four areas are ones that Jain as a company are looking for Australian collaboration to enhance the performance of Indian growers.

It was also highlighted that Jain has a 500-hectare farm in Jalgaon - Jalgaon is a city in western India. The city is located in northern Maharashtra and serves as the administrative headquarters of the Jalgaon district. Jalgaon is nicknamed "Banana city" as the region contributes approximately two third of Maharashtra's banana production.

A further meeting was organized for the Genesis team to meet in Delhi with Dr Sangita Ladha, VP-Marketing and Business Dev, Jain Irrigation, New Delhi.

Aditya Birla Group

Introduction:

Aditya Birla Group is an Indian multinational conglomerate headquartered in Worli Mumbai, Maharashtra, India. It operates in 34 countries with more than 1,20,000 employees worldwide. The group was founded by Seth Shiv Narayan Birla in 1857. The group has interests in viscose staple fibre, metals, cement (largest in India), viscose filament yarn, branded apparel, carbon black, chemicals, fertilisers, insulators, financial services, and telecom.

The group had a revenue of approximately ₹3,42,930 crore (US\$48.3 billion) in 2019. It is the third-largest Indian private sector conglomerate behind Tata Group with revenue of just over US\$110 billion and RIL with revenue of US\$90 billion.

Interview with Aditya Birla Group



Left to right - Prasad Bhogale, Khushboo Sharma, Stephen Manallack, Tony Bundock and Shirang Sirsikar

Detail:

According to Shirang and staff members at Aditya Birla, 95% of Indian farmers operate on properties with a total acreage of 2 acres (0.8 hectares) and larger farmers are operating from 10 – 15 acres (4 – 6 hectares). So in order to gain a return on investment, the group believe that growers need to look at operating from a two hectare base as a minimum, and utilising hydroponic production methods.

The Aditya Birla New Ventures team are presently incubating a start-up in the Agri Business space. They are connected with 10 farmer groups (ecosystem of 10,000+ farmers with majority small land holder farmers i.e. landholding less 5 acres). The supply base is located at strategic location which they believe will serve major demand centers within India and exports hub. Currently the farmer groups are serving major modern retailers and aggregators within country.

Aditya Birla are looking for opportunities for partnering with leading innovators, academic institutes/universities, research institutions, practitioners, Impact investors in the Agri space across the globe to bring sustainable and scalable business opportunities to the Indian 'Farm to Fork' ecosystem. Some areas of their current focus are:

1. Collectivization of increasing dwindling farm sizes especially growing high value crops (Fruits and Vegetables, Herbs and Spices) to achieve economic scale –business models, systems, technologies.
2. Cultivation with rightsizing/eliminating chemical fertilizers and pesticides. If possible, replacing those with natural substitutes preferably local ingredients (thereby reducing /eliminating carbon footprint and adverse ecological effects with overall positive economic impact)
3. Post-harvest loss prevention technologies – Storage and other post-harvest technologies used especially for Fruits and Vegetables preferably powered by renewable power sources (Solar, Biofuels etc)
4. Value additions to farm produce – Technologies for processed products which prolong shelf life of products in natural form or processed form with use no or minimal use of food chemicals and harmful ingredients. E.g. Freeze drying, vacuum frying
5. Data driven precision agriculture – Systems/subsystems for analyzing the variables/parameters in agriculture using IoT sensors, Satellite, Robotics and drone based technologies during cultivation, rapid residue analysis test kits for post-harvest and traceability solutions
6. Goat Milk and Milk products
 - a. Identifying adulteration of Goat milk with Cow/Buffalo milk in effective way
 - b. Development of High value addition products such as Infant formula, Cheese, Whey products etc.
 - c. Evaluating mobile transportation units for transferring milk
 - d. New technology in processing such as Instant pasteurization
 - e. Genetics Study and Feed management

In terms of Horticultural production, the team believe that the crop focus would need to be on red, yellow and green capsicums, tomatoes, cabbages, grapes and berries as the major product lines. There was also general consensus that open cultivation was not the preferred growing method, especially if the aim is to produce high quality product suitable for export markets

Another major hurdle identified by the group is that there is a major challenge in getting produce to market. The key issues seem to be that there is a problem in lack of cool storage and cooperative storage centres. The lack of storage obviously impacting on the shelf life of produce.

Training was another area needing attention. According to the group, farmers in the Nashik area are quite advanced and open to change, but they need training in how to produce new crops – currently there is a big knowledge gap in the area.

In order to achieve their goals, the Aditya Birla group believe they need assistance with:

- Training
- Marketing
- Cultivation
- Cold storage

According to the team, the Indian Government is focused on adopting overarching projects that have a theme of “by farmers for farmers”

Attention was drawn to an organisation known as Yuva Mitra – this is a social development organization working in Sinnar taluka of Nashik district since 17 years. They work with a large number of target groups including women, youth, farmers and children focusing on water resource development and management, agriculture and livelihood development, institution building and health through people participation In the Nashik area only 10-20% of farmers have irrigation, so a first step of collaboration might be to extend irrigation and introduce technologies in this area.

Yuva Mitra believe in the people-centric approach of development and ensure values such as integrity, discipline, transparency, care, quality work and innovation. Yuva Mitra envisions "A development process of the alienated sections of the society, where people are at the core of its decision making and action, beyond the model of welfare schemes".

Yuva Mittra is keen to collaborate on creating a Facilitation Centre which would also provide content and training. It is keen to support and deliver pilot projects which cover training, cultivation and technology. However, for this goal to be reached, it is envisaged that business support for such a project would be required.

The group now has an export license – so they are interested in information as to what products they could send to the Australian marketplace.

Weikfield Products Ltd

Introduction:

Weikfield began by manufacturing and selling three products to the local market - Cornflour, Custard Powder and Baking Powder. After over 60 years of existence, Weikfield today is the largest seller of Custard Powder, Cornflour, Baking Powder, Vegetarian Jelly Crystals in India. Weikfield has three state of the art manufacturing facilities – two in Pune, Maharashtra and one in Nalagarh, Himachal Pradesh.

Living the legacy of giving back to society, the Weikfield family started the Malhotra Weikfield Foundation in 2007, which grants Scholarships in the Sciences to more than 150 needy students from rural Maharashtra every year. The Foundation is also setting up a state-of-the-art Vocational Education Centre with Swiss collaboration to educate rural youth in precision engineering and modern agricultural skills.

Interview with Mukesh Malhotra



Left to right - Stephen Manallack, Mukesh Malhotra and Tony Bundock

Detail:

As one of their family's Corporate Social Responsibility (CSR) initiatives, Weikfield have a CSR arm known as the Malhotra Weikfield Foundation. This has seen a collaboration with a number of Swiss companies (including Syngenta), to set up a skilling centre of excellence focused on skill development in the fields of Agriculture and the "skills of tomorrow" such as mechatronics, robotics, IOT et al under the title of the "Indo Swiss Center of Excellence, Pune" or ISCEP for short.

The Syngenta Foundation is leading the Agriculture Center of Excellence and one of the goals is to increase (or more directly, double) the income of farmers in the State. This has already led to the establishment of a 2-acre model farm with polyhouses for growing purposes, and the group have been conducting short term courses at the CEA.

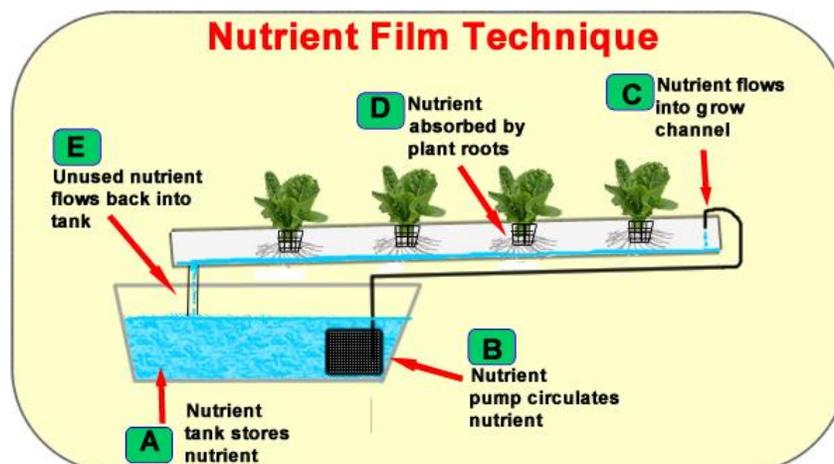
Hydroponic growing is seen as the next step for the foundation as it seeks to assist and train farmers to derive a greater income from the land.

Accordinging to Weikfield, the average small farm makes INR80,000 per year and the foundation wants to help double that to around INR180,000 per year.

One innovation that has been identified – which could be for women in rural areas – is to develop a low cost hydroponic basic model which could be utilized on the small acreage plot. The intent here being that women farmers would grow vegetables and fruits, with Weikfield buying the produce and taking the same to market. In the Weikfield scenario, the marketing is not the issue – but establishing a system and ready supply of produce via growing is.

The request was made whether the Genesis project could design a low-cost hydroponics kit for the foundation? This could then be followed on with the design of a suitable learning system –and some supporting train the trainer programs.

The Genesis team have offered to supply the design for free to Weikfield based on a simple nutrient film technique that would support leafy green vegetable production. An example is shown below:



Jain Irrigation – Dr. Sangeeta Ladha

Introduction:

Jain Irrigation Systems, often known as Jain Irrigation, JISL, or simply Jains, is a multinational conglomerate organisation based in Jalgaon, India.

JISL employs over 12,000 employees, 11,000 Dealers and Distributors and has 33 manufacturing plants worldwide. It develops, manufactures, supports and sells diversified products, including drip and sprinkler irrigation systems and its components, integrated irrigation automation systems for monitoring and control, dosing systems, PVC and PE piping systems, plastic sheets, greenhouses, bio-fertilizers, solar power, solar water-heating systems, solar water pumps, turnkey biogas plants, photovoltaic systems and tissue culture plants. JISL also processes dehydrated vegetables, spices, concentrated & frozen fruits or pulp. It also provides turnkey projects and agronomical support services.

Interview with Dr Sangeeta Ladha - Jain Irrigation



Left to right - Tony Bundock, Dr Sangita Ladha, and Stephen Manallack

Detail:

A meeting was held with Dr Sangita Ladha, the VP Marketing and Business Development, of Jain Irrigation Systems Ltd.

Dr Ladha advised the team that Jain Irrigation are into all aspects of horticulture – plastic piping, solar, greenhouses, hydroponics, tissue culture, vertical farming and drip irrigation, and are indeed the largest Indian company in this field. The company has also been a large investor in Israel for many years and are currently moving into food processing in a big way – a current project they are working on involves a collaboration with Coca Cola for a Mango drink. Jain also retain a large commercial farming interest and have a 12,000 acre (4046 hectare) Research and Development farm.

As an organisation, Jain advised that they would be keen to be involved or even lead a delegation to Australia, but it would need to be via either The Confederation of Indian Industry (CII) or The Federation of Indian Chambers of Commerce and Industry (FICCI).

Dr Ladha advised that she would be keen to work with the Genesis team to develop a proposal to work with Jain in several areas:

- Training – Jain would be keen to develop a training program with Australia – providing good design for protected cropping and hydroponics, including train-the-trainer programs – both could be done via Jain.
- Hydroponics – design and training plus automation
- Urban Farming – the concept of growing within an urban area using hydroponic methodology to support intensive small-scale production of vegetables.

The Genesis team was invited to visit the Jain centre in Jalgoan, Maharashtra, but due to time constraints this was not possible. However, the invitation has been extended as an open invitation for the teams next Indian visit. This could also be combined with commercial training for farmers.

Cravo group – Rajender Kumar and Shashank Jain

Introduction:

Cravo are a 43-year old Canadian, family-run business with 38 years of experience in the design and manufacturing of automatic retractable roof houses. As a company, Cravo have built up substantial experience through research and by partnering on projects across 6 continents in the fruit, berry, vegetable, flower and reforestation sectors. Cravo have invested in their own R and D facility in mid and hot climates to develop optimum crop management protocols using automated roof and wall structures.

Interview with Cravo representatives



Left to right, Shashank Jain, Stephen Manallack, Tony Bundock, and Rajender Kuma

Detail:

The Cravo group are arguably one of the most progressive companies in helping to develop modern style protected cropping and hydroponic growing in India. Rajender Kuma has worked closely with the founder of Cravo – Richard Vollebregt – to encourage Indian growers to adopt their particular brand of technology.

The concept behind the Cravo system is that it is a retractable roof system as opposed to a completely enclosed protected cropping system. This is a particularly suitable for humid conditions in India where it is almost impossible to reduce humidity.

In general terms, growers can produce their crops in an 'outside' environment utilizing border soil or hydroponic media when conditions are favourable for plants to be exposed to natural sunlight. If temperatures fall below a pre-determined threshold, the roof can be

automatically closed to protect the plants. This is also possible to protect crops from the effects of rain or high winds. If radiation levels reach an above optimum level, the roof can be closed to provide a percentage of shade for the plants. As the covering structure is opaque, this still means that sufficient light to support plant growth is still available.

The automation of the systems is now being supported by the Dutch technology company – Priva. As world renowned leaders of climate control, Priva have adapted their greenhouse control technology to integrate with the Cravo automation to provide a combined solution for the grower.

The Cravo representatives advised that every Indian state owns farms but that not many of them use poly or glasshouses. Much of the previous promotion of protected cropping has been on systems which are not right for local conditions and this causes some resistance to the concept.

There is a significant productivity gain to be made with correct usage of poly or glasshouse systems adapted to local conditions. This would apply for summer and also the rainy season. During summer and the rainy season there can be a huge gap in supply. Especially in the rainy season where crops can be affected by flooding, the supply is reduced and prices go up by four or five times almost overnight.

Cravo is working with the Simply Fresh team in Hyderabad.

Most Cravo clients are corporate farmers or the bigger individual farmers – mostly with 10 hectares plus.

Cravo believe that the need is there for demonstration of protected cropping and for training – their view is that at least two centres would be needed, one for each of the north and south. These two encompass the major climatic differences in India, however there are some 16 agri-climate zones in India. The Central Government provides some form of farmer subsidy for putting in protected cropping systems.

But the view of Cravo is that the biggest shortage is in training.

The language in India is around “high tech farming” and there should be an opportunity to team up with local Indian protected cropping groups to create active lobbying at state and central government level.

An Australia-India training team to work with this sector would be well received and should focus on “high tech farming” topics such as greenhouses, automation and hydroponics.

Such a project should also target “urban farming” which they define as those mid-size farms within a 50km radius of cities.

Cravo has the IP needed for much of the above and would be a willing participant in such an Australia-India project.

Governments would need to be active participants too, as they have the hostels, lecture rooms and research centres.

There is no centre for demonstration and training of hydroponics in India and this is a big opportunity because corporations want to invest in hydroponics. Australia is seen as having a similar climate and so there would be a strong basis for collaboration.

VAS Agri Pvt Ltd / Junga FreshnGreen

Introduction:

VAS Agri Pvt Ltd is owned and operated by Sandip Bhati. According to Bhati's LinkedIn profile he is a seasoned professional with over 30 years of practical experience in and solid understanding of diverse range of business management applications, including logistics and supply chain, sales and marketing, operations, commercial and quality assurance. Demonstrated ability to select, train and retain self-motivated, customer-oriented employees. Strong negotiating skills, exceptional problem-solving abilities and a keen client needs assessment aptitude. Tenacious in building new business, securing customer loyalty and forging strong relationships with external as well as internal business partners.

Sandip's specialisations include: Strategic Market Positioning, Account Development/Acquisition, Key Client Retention, Solution Selling Strategies, Contract Negotiations, Crisis Management, Budget Management, Broker/Vendor Relations, and Territory Growth/Development

Interview with Sandip Bhati

Detail:

Sandip Bhatia advised the Genesis team that he is currently setting up the first stage of a hydroponics project in Shimla – which will eventually extend to 15 acres (6 hectares) This is a joint venture with the Netherlands based company Westland. Additional support is also being sourced from an Israeli company. The target for the project is the production of perceived “high end” crops such as iceberg lettuce, strawberries and cherry tomatoes. Premium products such as blueberries and strawberries will also be produced to target sales to premium stores such as Food Hall.

Sandip noted that the word “hydroponics” is widely misused in India and can generally be applied to drip irrigation. This is largely part of misinformation that has been fed to the wider horticultural community and as such needs to be corrected. Sandip took the view that anything to do with Horticulture is currently a big topic in India (protected cropping, hydroponics) and he advised the team to look at a targeted program of roadshows to promote our findings and developments.

In terms of marketing Sandip also advised that having a market before initiating production is also vital in the Indian marketplace, and that over production should be geared towards some form of processing where possible to avoid wastage.

Counsellor Agriculture, Australian High Commission

Introduction:

The role of Agriculture Counsellor is a federal government appointment who are generally based overseas. Australia have 22 agriculture counsellors based around the world in key trade locations. They promote Australia's agricultural interests, and help our agricultural sector grow.

The role of the agriculture counsellors is to work with our biosecurity, exports and trade and market access teams. Together, they improve and maintain market access for Australian agricultural exports.

The agriculture counsellor undertakes to:

- explore and develop new market openings for Australian farmers and exporters
- maintain existing market access
- improve technical market access
- provide market intelligence
- manage sensitive policy issues
- represent Australia at meetings and negotiations
- resolve issues when Australian agricultural goods arrive at their foreign destination.

Interview with John Southwell, Counsellor (Agriculture) and Susan Mathew, Senior Research Officer



Left to right, Tony Bundock, Stephen Manallack, John Southwell and Susan Mathew

Detail:

John Southwell, Counsellor (Agriculture) and Susan Mathew, Senior Research Officer Australian High Commission provided some interesting insights into the Indian agricultural and horticultural landscape.

One initiative of interest is the policy of the Central Government to encourage “cooperatives” to consolidate farms via creation of 10,000 Farmer Producer Companies or Organisations. The benefit of this initiative is that growers will be able to access credit with a sovereign guarantee. In essence it would seem that technology for hydroponic growing etc will be funded by government.

However, it seems that the biggest ongoing issue is water. This is an issue that can be resolved. Examples of high water using crops were given as Sugar Cane in Maharashtra which uses 85% of water and only contributes 4% of agriculture produce.

The general result of the discussion was that India has a ‘problem worth solving’, and this hinges on the following:

- Greater efficiency in water usage – more production from less
- How to increase farmer incomes
- Climate change factors

Dr B.N.S. Murthy, Horticulture Commissioner, Ministry of Agriculture and Farmers Welfare

Introduction:

India has recently appointed Dr. B.N.S Murthy as the new Indian commissioner for Horticulture, where his main target is to double the average income of Indian farmers. Earlier he was serving as the Principal Scientist (Hort) & I/C. Head, Division of Fruit Crops, Indian Institute of Horticultural Research. His area of specialisation is Horticulture- Fruit Crops improvement; Propagation including tissue culture. He graduated in Horticulture from UAS, Bengaluru. He is also recipient of national and International awards for his work.

Murthy has stated that the Indian horticultural sector is in a phase of rapid growth, "I would like to work for the farming community. A couple of our objectives are to attract a new generation for Indian agriculture, which is set to be based on technology driven ventures. We want to provide input with regards to such issues as good quality planting material, marketing issues, residue free production and the prevention of post-harvest loss. In the end, we want the Indian horticulture sector to be a vibrant and profitable venture."

Interview with Dr BNS Murthy, Horticultural Commissioner

Detail:

Dr BNS Murthy explained that his commission is planning for clusters of farmers – and this is seen as the future for farming in India.

The issue of market access is still a key issue according to Dr Murthy, India either has gluts or scarcity of product, and continuity seems to be lacking. Plus losses post-harvest are great, and this can also be attributed to lack of cool storage etc.

Dr Murthy explained that his commission has a Centre of Excellence in Horticulture in every state (29 states). These centres collaborate now with Israel and Netherlands and would be keen to collaborate with Australia.

The problem that Dr Murthy sees is that there is no Centre of Excellence dedicated to training relating to Hydroponic growing, and this is a solution that he is looking for. His view was that such a centre should perhaps be started in the south, where there is likely to be better reception due to the problem of short duration crops. Potential products would be kale, broccoli, cabbage, tomatoes, leafy greens and some fruits.

Dr Murthy made a request of the Genesis team to provide a proposal as to how both parties could work collaboratively in the future. The team will address this post visit,

Mention was also made of how the commission works closely with the KPMG company and the Genesis team are in discussion with KPMG to look at how further developments could be made.

Additional Interview – 1

Param Singh, Founder and Managing Director – MooFarm UDAY Skills Training Girls X Tech

Introduction:

Param Singh is a compassionate leader with an urge to see shared prosperity in the developing world. When he sold his first business to an ASX listed company in Australia (2015), he invested half of the sales proceeds and his family wealth in UDAY, a social enterprise he founded to empower disadvantaged youth, rural women and farmers in India – the country he loves for its mystical secrets.

Interview with Param Singh



Param Singh

Detail:

Meeting in Chandigarh, Sunday 17 November 2019

MooFarm is an Australian company with World Bank funding and support from Unilever India. Param has been supported by an Australia based global aid, development and impact investing company called Palladium, of whom the CEO is Christopher Hirst.

MooFarm is essentially an IT based business and its central product is a “cow face recognition app” which allows farmers to clearly identify their herd plus it provides feedback on health etc. including breeding cycle information. UDAY Skills training provides skills upgrade in the dairy sector.

The model

To gain access to farmers via training (which is funded by Unilever)

MooFarm then takes over with the mobile app to provide detail relating to::

- Digitised breeding cycle
- Data on breeds
- Tool for buying feed, insurance, get credit to buy cattle
- Call centre for Veterinary advice and artificial insemination information

Next Product Development

The MooFarm app the uses light shining into milk and from that vision it can tell what is contained in the milk in terms of anti-biotic levels etc

Work with Farmer Product Companies (FPC) – a cooperative movement encouraged by Central and State Governments

Advice on Horticulture Project

Discussion was held around the idea of a horticultural training centre. Param relayed that he would prefer an actual to a virtual centre but could see benefit in a a combination. His primary view is that farmers need to have face-to-face interaction. In fact, he believes unless an organisation maintains face-to-face connection in India it is soon forgotten.

Blueberries are a hot market topic in India right now, and Param is aware of the Indian farmers who are growing blueberries in Coffs Harbour and Kinglake regions of New South Wales, Australia.

Param believes that the biggest change in farming and possibly biggest opportunity could be the creation of collaborative farming via Farmer Product Companies (FPC) – the Government has set an aim for 10,000 of these. An FPC is a grouping of at least 10 and up to 500 farmers into a collective including marketing. The Government will fund these FPC's and his view is that eventually all farmer subsidies will go via FPC's.

The rationale for farmer collaboration in FPC's

- Farm labour shortages are becoming big
- One-hectare farms not sustainable
- Input costs are rising
- Machinery not suitable option for smaller farmers
- Small farmers have zero bargaining power

Collaborative farming via FPC's solves most of above.

Additional Interview – 2 **Sidharth Charka, Farmogo**

Introduction:

Interview as a result of recommendation and contact via Michelle Wade, Commissioner – South Asia, Global Victoria.

Farmogo is a new business initiative based in Maharashtra between Mumbai and Pune.

Sidharth Charka is the Founder. Sidharth Charka graduated from PGDM from Indian Institute of Management Indore in 2009. He has over 12 years of experience in water resources and renewable energy industry for domestic and international markets specifically Asia Pacific and Middle East.

Throughout his career he has been involved in sustainability enabling companies such as Mahindra Susten, a renewable energy company and Mechatronics Systems Private limited, a water resource management company.

Sidharth has shown keen insights in new market/new product development and has also been involved in research and development of a few patented products

Farmago have just completed construction of 25000 square feet of growing space 2 hours away from Mumbai. This gives access to the bigger markets and also conducive for exports. They have begun trials of leafy greens and some vine crops. They have commitments from many B2B and B2C clients since they have protected cultivation with integration of IoT for climate, nutrition, we can also ensure consistency in our supply.

Farmogo positions itself as follows:

- Working in the field of climate-controlled hydroponics to produce clean vegetables and fruits - sustainably.
- Using technologies suitable to Indian environment to make products cost effective for the market
- Working towards a creating a fruit and vegetable brand encouraging a healthy lifestyle
- Incorporating GAP certification with traceability of all produce, with transparency to the end consumer on production process
- In future plan to introduce food products and more varieties of fruits and vegetables using own produce in the market under own brand

Interview with Sidharth Charka



Sidharth Charka, Founder, Farmogo Exotica Pvt Ltd

Detail:

The Farmogo team firmly believes that India desperately needs solutions in fight against climate change and water scarcity - which is largely affecting the agriculture in India, which already has one of the lowest yields despite the huge potential. Also, there is a rampant use of pesticide in the food that India consumes, the ramifications of which are in epidemic proportions in India. Having protected cultivation with hydroponics is a perfect solution, however one needs to be mindful on how cost effective these solutions need to be, to not limit these solutions to the elite. We are trying to solve these problems at Farmogo.

His project is seeking to attract more investment, more innovation and more varieties of fruits and berries, and like much of India, his location has a shortage of electricity and water.

His group has started trials with kale, rosemary, mint, lettuce and coriander. They will soon grow capsicums and also use grow bags for varieties of vine crops. Longer term, strawberries and blueberries are possible.

His belief is the project does not need full scale greenhouses but needs some form of effective and economical cover. His covers and systems are produced in India.

Exotic vegetables attract a premium margin right now – and he sees the future being “branded vegetables” which can substantiate “clean and green” production.

His view is that 80% of his market will be hotels and restaurants – but retailers such as Big Bazaar, Big Basket and Future Group are interested. Another likely market is home delivery. He is aiming for long-term contracts with these groups.

Farmogo believes that traceability and sourcing information can provide a market edge.

Farmogo is seeking collaborations, partnerships and suppliers across:

- new technology
- new seeds
- post-harvest technologies
- non-plastic packaging
- hydroponics

JV's and other commercial arrangements are possible as Farmogo seeks to expand – the ideal would be an Australia-Farmogo JV with clean and green credentials.

Additional Interview – 3

Avinash Kshirsagar, Director, Chaitanya Agro Pvt Ltd

Introduction:

Chaitanya Agro Pvt Ltd is a family owned Maharashtra company based in both Pune and Nashik. The primary current focus of the business is on supplying grapes to the Indian wine making industry.

Avinash Kshirsagar is a qualified accountant who has recently joined the family company.



Pictured is Avinash Kshirsagar, Director, Chaitanya Agro Pvt Ltd

Detail:

According to Avinash Kshirsagar the business is looking to diversify from grapes into broader areas of food production including protected cropping and hydroponics. The company has land in both Nashik and Pune which could be used.

Avinash has been studying changing diets, changing food and wine demands and how to meet the needs of the growing “millennials” market of Indians – there are 450 million aged between 21 and 37. His view is that there is very little use of and knowledge about hydroponics and various forms of protected cropping – but there is increasing interest.

Their concept is to first establish a demonstration project in protected cropping and hydroponics which would showcase the approaches and also become a centre for training. This would be best located with easy access to Pune.

Additional Interview – 4

Kuchibhotla Srinivas

Partner - Advisory (Food & Agri) KPMG India Private Limited

Introduction:

KPMG was established in India in September 1993 and has rapidly built a significant competitive presence in the country. The firm operates from its offices in Ahmedabad, Bengaluru, Chandigarh, Chennai, Gurugram, Hyderabad, Kochi, Kolkata, Mumbai, Noida, Pune and Vadodara, and offers its clients a full range of services, including financial and business advisory, tax and regulatory, and risk advisory services.

In India, KPMG has a client base of over 2700 companies. The firm's global approach to service delivery helps provide value-added services to clients. The firm serves leading information technology companies and has a strong presence in the financial services sector in India while serving a number of market leaders in other industry segments.



Pictured is Kuchibhotla Srinivas, Partner-Advisory (Food & Agri), KPMG India

Detail:

Srinivas strongly supported the concept of a collaborative arrangement rather than a “stand alone” approach. Important to customize for India.

Problem is the cost of technology is too high – and the perceived needs in India are lower so a customized approach should achieve a cheaper price but with the opportunities for scale that India presents. He did not feel that technology solutions for agribusiness had been previously showcased in India.

Any customized approach should also consider accessing the deep market reach of Jain Irrigation.

In terms of farm and land ownership, a foreign corporation cannot own land on its own – so would need to consider a Joint Venture which does own the land. In India a corporation cannot own more than 500 acres of farming land.

Farmer Producer Companies have been using a few models, but the cooperative model has not worked well whereas the company model is gaining some traction. However, success stories are isolated. The best are doing well because they are market driven and have market access. This FPC concept will take 5-10 years to deliver.

Growth in horticulture is strong and branding of products is impacting the market. Middle class consumers are demanding brands in products such as bananas, apples, grapes and pomegranates.

Vegetables is at a different market stage and India will see investment in this – the whole food service chain is growing, and demand for “exotic” vegetables is up. The move is starting towards protective cultivation and there is some small move to hydroponics (leafy greens, celery, mint, coriander, capsicums). This is a significant change and needs investment.

Protected cropping is generally at a very basic level in India and any technology is customized (simpler, cheaper) for India. At this basic level there is not much need for or desire for skills upgrade via training – that would come as the methods and technology become more sophisticated.

It is still the case that the majority in the India market buy fresh each day – nobody buys fruit and vegetables for the week ahead. But the consumer is changing towards higher quality though there remains price sensitivity. Two markets are emerging – premium and non-premium.

Three factors are key for investing in horticulture:

- Going to the geographic locations where farmers and progressive (such as around Bengaluru)
- Best in those fringe areas between urban centres and rural
- Needs co-investment in the supply chain (very difficult to get this in India)

Additional Interview – 5

Australian based interview with Marcus van Heijst, Priva NL

Introduction:

Marcus van Heijst is the Oceania Manager for the Priva NL company. As part of his role within the Priva organisation, Marcus also manages projects and associated dealer issues within India. Marcus is based in Melbourne, Australia, but travels extensively. Marcus is also a board member of Protected Cropping Australia.

Interview with Marcus van Heijst



Marcus van Heijst

Detail:

Marcus explained how he is currently working on two major projects in India that are utilising Cravo retractable roof structures. In his view, this type of structure is an ideal naturally ventilated structure for climates featuring periods of high temperature combined with high humidity. The reason is that the roof can fully retract providing 100% ventilation when conditions are suitable. The structure can also be configured to provide high ventilation rates during periods of rain while protecting the crop.

In Marcus's view, other structures/production systems may also be suitable for India, including Semi-Closed glasshouses with dehumidification features, and indoor production systems / vertical farming.

Although potentially offering the possibility of significantly higher yields, these latter production systems also require a significantly higher level of investment.

Project 1 –Triangle Farms

Location: near Hyderabad

Structure: Cravo retractable roof

Number of structures: 1

Total Area: 5ha

Crop: Capsicum

Priva systems: control, fertigation, water treatment

Project 2 –Simply Fresh

Location: near Hyderabad

Structure: Cravo retractable roof

Number of structures: 5

Total area: 8ha

Crops: Turmeric, vine crops, leafy greens, soft fruit, nursery

Priva systems: control, fertigation, water treatment

In his travels through India, Marcus has visited suppliers and growers in and near three major cities:

Delhi

Hyderabad

Bengaluru.

The following summarises Marcus's observations.

- Indian vegetable/fruit market

When travelling through India it is obvious that there is a shortage of good quality, safe, fresh fruit and vegetables. Although there are many stores that sell produce, the quality is often poor and food safety is questionable. This is especially the case in many of India's cities. It is expected that the demand for fresh, safe, good quality produce will grow rapidly in the coming years.

- Indian horticultural technology level

Most of the food production in India is still at a relatively basic level. Although rainfall levels are high in many places, lack of good storage systems means that water used for irrigation is often of poor quality and not well managed. The soil in many places appears of good quality however continual production in the same soil combined with poor water and fertiliser management is probably preventing optimum crop yield and quality. Access to the latest systems and techniques is limited despite the governments willingness to invest.

Many "Centres of Excellence" have been constructed using local and some imported technology. The demonstration systems don't seem to translate much into the market as the average Indian grower still uses basic poorly vented polyhouses with little or no climate automation. A number of growers use automatic fertiliser dosing systems, these are mainly locally developed and are of a poor design compared with systems developed in countries with a long history of high technology crop production, such as the Netherlands.

- Subsidies Besides Centres of Excellence,

The government subsidises small parcel land owners for greenhouse projects of no more than 1 acre. The greenhouse design must conform to a standard set by the government. The design is for a structure with poor ventilation and no automation. Larger projects and/or more technology are not subsidised by the government. This discourages the average grower from making steps into larger, more efficient, greenhouses with better

technology. It also discourages local technology suppliers from offering/investing in better systems more suitable for efficient production systems. This means that most larger scale projects are financed by private investors who require a return on their investments. In the short term at least, the availability of good quality, fresh and safe produce at a level affordable to the majority of India is unlikely.

- Import duties / customs

Currently the Indian government charges 30% duty on most imported material/products. This includes high technology greenhouse production systems and associated automation. Also the customs process is very rigorous, bureaucratic and time consuming. These factors discourage investment into larger, more efficient, production systems. It also puts Indian growers at a disadvantage compared with growers in other countries in the region.

- Knowledge/training

The government shows the will to help educate local growers by subsidising Centres of Excellence, training programmes etc. However, by not encouraging efficient scale production systems, and without access to appropriate technology, growers aren't able to maximise the potential the training offers them

- Local experience

Without a lot of experience with efficient scale production systems, local investors are willing to invest but have to rely mostly on overseas knowledge and experience

In summary Marcus believes there is a clear need and demand for good quality, fresh and safe produce. Currently the supply is fragmented. A small number of investors are investing in suitable production systems. There are a number of barriers to investment slowing development. Some of these barriers appear to be due to policies set by the Indian government

Additional Interview – 6

Distance interview with Akhil Kumar

Introduction:

Akhil Kumar is the founder of Eden Horticulture Services – which is an independent consultancy firm in India which provides all kind of services related to horticulture crops (Vegetables, Flowers and Fruits). Established in 2016 at Karnal (Haryana) the company provide consultancy service across India. The company motto is to Educate, Empower and Employ the people.

The major focus areas of the company are protected cultivation (Poly house and Net house), Soil less agriculture, Hi-tech nursery and hydroponics system. The company consists of a diverse group of Scientists, Vegetable experts, Flower experts, seedling experts and Micro irrigation experts. The team also has international experts from Israel who have a vast experience of working in India and have executed several Indo Israel project in different states. The company “experts“ have several years of international exposure of hi-tech agriculture farming in both Israel and Australia. The company adopts an holistic approach of plant science while dealing with projects viz. soil and water chemistry, best seed material, climate control, crop management, harvesting and post-harvest management. The overall company aim is to share the “know how” technology of modern agriculture including drip irrigation mulching, crop protection and crop management.

Interview with Akhil Kumar



Akil Kumar

Detail:

The following questions were posed, and answers received

Please provide an outline of your business and where you operate in India

Eden Horticulture services are basically a consultancy firm which share their knowledge and know how to people who are interested in Hi-Tech Horticulture. We assist our client to design his projects as per land area /investment size and location.

We also publish one bimonthly magazine EDEN HORTI, we conduct training programme as and when required, we organize study tour for potential investors, progressive farmers and to build B2B networking.

2. What existing area of horticulture would you regard as needing upskilling in terms of production methods?

We educate, empower and employ youth in Hi Tech Horticulture. Which includes Greenhouse cultivation, soil less cultivation, plug seedling nursery, Exotic vegetable cultivation by using precision tools like drip irrigation, mulching and stacking etc. In nutshell we deal with all know how from bed preparation till crop harvesting. Though we are willing to expand our horizon in post-harvest management also.

3. With water availability being an issue in India, would you consider the adoption of more technology for accurate irrigation to be a key area for development?

YES, this is need of hour. Already government is giving lots of subsidy for drip irrigation and micro irrigation kind of technology in this area. Although people are not much aware about automation and precision tools like Tentiometer etc. So, there is scope, but challenge is water is free of cost in this region so far.

So far in water management Israel has their monopoly and they are doing several big projects in agriculture but also under umbrella of smart city, waste water management and sewage water treatment etc. I have been in Israel for 4 years thus I can understand how difficult it is to deliver some successful project in India.

4. Do you believe that there is an opportunity for smaller farmers to adopt hydroponic growing methods?

This is biggest challenge for us. Indian farmers need to be classified into three segments. 1- Small and marginal farmers (up to 80%) who farm with minimal investment and do not have money to invest for such technologies.

2- Progressive farmers (10-15%) - these kind of farmers are in Haryana and Punjab and they may be potential client for such technologies.

3- Corporate Farmers (approx 5%) - these are already doing such projects in this area. Whether they are in profit and loss is another mystery...

So, second and 3rd category could be relevant segment since these people can fetch better retail price through branding and marketing in peri urban area.

5. Existing centres of excellence would seem to be equipped with inappropriate structures in many cases (pad and fan cooling in humid areas etc) What technologies would you see as being essential if such a facility was retro fitted .

I have worked for one year at FIRST Center of Excellence (Indo Israel Centre) at Gharaunda and I know there are many problems at different levels and it has been only a showcase model. You need to understand Indian research development and their

extension methodology. It's quite complicated thus need to be discussed in details. I think individuals have to customize their own design, PoP and methodology on own risk then only we can introduce advanced technologies in India.

6. What are the limitations you see in terms of small farms being able to adopt new technologies?

Most of small farm belong to family whose annual income cycle is in rotation. e.g, what they make profit from rice they will invest in sowing of wheat. What comes from wheat will be invested in rice. For both (wheat and Rice) crop government provide minimum support price and they buy so people so not opt for other crops. Another challenge is horticulture crop is labour intensive in comparison to field crops.

7. Please comment on any topic that you would like to raise for consideration in a report – we are listening!

I don't know what kind of report you are making and what are agenda. So its difficult to give my point in context of your report. If you are willing to start some business venture I may assist you. But you may read my magazine editorial <https://edenhorti.in/magazine/>

Additional Interview – 7

Distance interview with C.V. Prakash

Introduction:

C.V. Prakash is a former Officer of the Indian Navy. Upon his retirement, he migrated to Australia in 2001. CV learnt Hydroponics from the best of growers and consultants in the Hydroponics Industry in Australia and is a passionate proponent and pioneer in the field of Hydroponics in India. He wears several caps and plays the role of a hands-on Grower, a Hydroponics Consultant and Trainer in Hydroponics, both Simplified as well as Commercial. The works done by him can be seen on www.petbharoproject.co.in and makes for motivational food and is an awe inspiring project which he named fondly as the “Pet Bharo Project” which translates to “Fill Your Stomach” and he commenced his mission in India way back in 2008. His mission- to bring technology that can help almost everybody grow clean, residue free, nutritious food to every person on the planet through tried and tested methods. Was a keynote speaker at the National Conference on Food and Water Security in 2009, India. Most recently in Feb 2012, an invitee cum keynote speaker at the 2nd Global Agri-Business Incubation Conference at IARI, New Delhi, held by Network of Indian Agri-Business Incubators. His company was recently selected by NEC Japan, to be their Lead Partner for their “Smart Village” Corporate Social Responsibility Program and were selected amongst a big list of large Indian horticultural companies. CV has also tested his first prototype of an animal fodder machine in India with outstanding results. CV’s company is also credited for first commercial hydroponically grown strawberries, spinach and herbs. CV has developed his own food park designs. CV is credited for building India’s first Commercial Hydroponics Greenhouse, at Bangalore, which is a project developed from ground zero and is an end to end sustainable hydroponic farming solution. CV has proven by personal example that hydroponic produce will find its way to a consumer’s plate by supplying world class quality Spinach to Bharti-Walmart, in Bangalore.

Interview with C.V. Prakash



C.V Prakash

Detail:

Following questions posed and answers received

1. Please provide an outline of your business and where you operate in India.

Aggragannya Skills Pvt Limited are at the forefront of Skill building in Soilless /Hydroponics horticulture. The founder is the pioneer in this field in India having taught more than 11000 students since 2008 in simplified hydroponics. www.petbharoproject.co.in

2. What existing area of horticulture would you regard as needing upskilling in terms of production methods?

Indian horticulture is being pursued without any science behind it. It's a very unorganised scenario. Every form of horticulture whether protected or non-protected needs real time help. There is an urgent need to skill people in this area in order to lessen the use of chemical pesticides, improve yields. We need to have sufficient authentic skill building centres managed not by the government but by private players.

3. With water availability being an issue in India, would you consider the adoption of more technology for accurate irrigation to be a key area for development?

Yes, very much needed. Irrigation and fertigation...when and how is something very few understand in India.

4. Do you believe that there is an opportunity for smaller farmers to adopt hydroponic growing methods?

Unlikely with conventional farmers like the case around the world. Possibility of changing from soil to soilless is .0000001%

5. Existing centres of excellence would seem to be equipped with inappropriate structures in many cases (pad and fan cooling in humid areas etc) What technologies would you see as being essential if such a facility was retro fitted.

We actually need brand new Centres of Excellence in India and run by private players. Government has failed miserably with the existing COE's.

6. What are the limitations you see in terms of small farms being able to adopt new technologies?

Skill /Passion etc

7. Please comment on any topic that you would like to raise for consideration in a report – we are listening!

I have supplied a document for your consideration as a reference document. -

See attachment 4

Conclusions and the way forward

India and Australia are well positioned to become the food bowls of the Indian Ocean Rim – including Southeast Asia, the Middle East and Africa.

Protected cropping and hydroponics offer the opportunity for India and Australia to work together in horticulture, for mutual benefit – adapting equipment and techniques to suit India.

A collaborative model of engagement between India and Australia will not only produce positive horticulture outcomes, it can become the strong relationship basis for extensive skills training and product trade.

Initial and short-term actions

Conduct seminars in at least Sydney and Melbourne for the launch of our report and to consolidate interested individuals and organisations around future actions

Continue to exchange information and build relationships with the Genesis “Four Collaborative Horticulture Groups”

Coordinate with India and Australia at the level of governments, industry and education to hold a first India-Australia Horticulture Collaboration Conference in India in the first half of 2020.

Complete the Genesis CSR initiative to design a simple hydroponics production process which can be used by rural women via the Malhotra Weikfield Foundation

Medium and long-term actions

Coordinate with India and Australia at the level of governments, industry and education to hold a second India-Australia Horticulture Collaboration Conference in Australia in the second half of 2020.

Build a Virtual Australia India Centre of Horticulture Excellence

-website

-apps

-linkages and contact enabler

Create an Australian team to target opportunities with the growing number of Farmer Producer Companies (FPC) – with a target if creating 10,000 FPC’s there will be demand for business acumen, market linkages, better insurance terms, quality assessment infrastructure, precision agriculture solutions for better crop management, access to finance and IoT based applications.

Locate partners for extension of the Genesis CSR initiative (designing a simple hydroponics production process which can be used by rural women via the Malhotra Weikfield Foundation) to other areas of India

Gain support among Australian governments and industry for the concept of a farmer exchange program between India and Australia

Genesis Report and “An India Economic Strategy to 2035”

A major report was presented to the Australian Government in 2018 titled “An India Economic Strategy to 2035” by Peter Varghese AO. This report has provided a framework for our research project. As can be seen from the following extracts, there is substantial compatibility between the two reports.

A major finding of the Varghese report was:

“There will be strong and sustained demand in India for agri-services, consulting and technologies in areas where Australia has expertise. The kinds of long-term partnerships that can achieve collaboration beyond simple exports and connect Australian players directly with industry include where Indian demand and Australian capabilities converge.”

The following specific extracts from the report informed our own work and the findings here are compatible with our own conclusions and way forward.

Among the “Priority Recommendations” for the medium term was:

32.3 Establish an Australia-India Food Partnership, including an International Agricultural Services Hub to package Australian policy, implementation and services expertise

The Food Partnership would provide a framework for:

- strengthening engagement between Australian and Indian agriculture and food industries
- strengthen Australia's reputation as a longstanding reliable partner in agriculture
- work with Indian policy makers to assist in the design and implementation of effective agricultural legislation, regulation and policy making.

The Hub could offer:

- a one-stop shop of advice across university, industry and public sectors
- blended financing, including in-kind contributions from the private sector
- a unique Australian brand
- bespoke services available through fee for service
- if successful in India the concept could be extended to other developing markets.

Chapter 5 – Agribusiness

- Out to 2035, India can provide a new source of growth for Australia's agribusiness sector. Despite India's focus on domestic production, the gap between demand and supply will grow out to 2035.
- Growth potential for Australian exports remains in commodities that India needs due to shortfalls in production (pulses, grains, horticulture, oilseeds). Opportunities also exist, or will emerge, for value-added products sought by the

growing middle class (wine, processed food) and for providing specialised services to Indian Governments, institutions and farmers.

- India's agriculture sector is politically sensitive (with a protectionist sentiment that is unlikely to fade). The central and state governments seek to balance smallholder and consumer needs with the broader goals of minimising social disruption and maximising electoral rural support. The Indian Government has three objectives: food security, food self-sufficiency, and income support for farmers.
- So India will remain a difficult market, prone to fluctuating import demand and sharp policy changes – hedging against this volatility is part of spreading risk. But there is scope for it to become more predictable.
- A strategic decision by the Australian Government to work more closely with India on reducing the need for market distortions and developing import pathways can both respond to Indian priorities and ultimately help commercial engagement.
- Towards 2035, we should seek to pair exports of raw commodities with exports of value-added products, integrate into value chains, and export of services to work with India on productivity improvements and increasing farmer incomes.
- We should be seen as a trusted partner to India's agriculture reforms and land and water management priorities and be the lead partner for these issues in key states.
- There are opportunities for Indian investment in Australian agriculture, including in Northern Australia.

Structural Drivers of this sector:

INDIAN DEMAND

India's overall food demand will grow at 2–3 per cent until 2025, and demand will outpace supply out to 2035 even if Indian productivity increases

- annual food demand in India is expected to increase up to 400 million tonnes per year by 2025 – a 37 per cent growth from 2015 levels – primarily in pulses, fruit and vegetables
- this is driven by demographics and a corresponding increase in volume demand and the growing consumer class, changing diets and a shift in favour of higher value products (such as proteins, fruit, dairy, packaged goods, high end products) similar to the trends seen in other developing countries
 - importantly, increased meat production can have a multiplier effect on demand for grains, protein meal, and fodder.

Growth is unevenly distributed regionally and across sector segments

- parts of India will be self-sufficient, but others deficient
- urbanisation is creating pockets of concentrated demand for high value products.
-

INDIAN SUPPLY

India is a major agricultural producer and agricultural output has grown at an average of 3.6 per cent per annum since 2011 - but the sector is highly inefficient and output is volatile.

Supply is constrained by:

- inadequate linkages to markets and distorted pricing mechanisms
- low resilience to the vagaries of nature, particularly fluctuations in monsoon rains
- scarcity of resources – especially water
- over extraction of groundwater by farmers will see some Indian states exhaust subterranean supplies by 2030, with significant implications for food security
- suboptimal acreage distribution and small holdings with challenges around development, appropriation, tree felling and land clearing food loss and wastage: by some estimates around 30 per cent of India's total yield is 'wasted' annually¹²
- land degradation: 40 per cent of India's land area is degraded through inefficient crop rotations or overuse of agrochemicals⁴⁵
- infrastructure and storage gaps and logistical challenges for distributing produce
- India's reactive and retrospective policies exacerbate domestic production and price cycles.
- Indian policy makers understand what is needed to improve the sector but political constraints make change difficult
- agriculture is the biggest employer in India with a highly migratory labour force and chronic underemployment
 - nearly 60 per cent of the agricultural labour force is female
- poverty and debt of small farmers are region-wide problems and the government allocates a lot of unproductive capital in an attempt to alleviate these issues through subsidies.

AUSTRALIA'S COMPETITIVE ADVANTAGES

Australia's existing agribusiness trade relationship with India is strong, but sporadic

- India was Australia's sixth largest market for agricultural exports in 2016–17
- trade is prone to sharp changes related to Indian Government policy and the level of domestic Indian production.

Australia has a lot to contribute to India in the agribusiness space. Australia:

- can offer agricultural science expertise to improve Indian food security by increasing productivity, sustainability and food system resilience
- is an efficient exporter of staple and high value products has world-class expertise in agri-services and land and water resource management.

These offerings are based on the following Australian food and agribusiness comparative strengths

- clean and green
 - strong reputation
 - low prevalence of food-borne illness
 - high safety standards
- unique geography
 - close to growing Asian markets
 - diverse range of agro-ecological zones
 - counter-seasonality to northern hemisphere
- world-class research
 - strong research and development sector, especially in agricultural science
- established sector with a global mind-set
 - strong knowledge, skills and infrastructure base
 - globally focused industry
- high proportion of SMEs
 - fast, agile and high innovation potential.

Farm Producer Companies (FPC's) Recommendation:

34.3 Deepen engagement with Farm Producer Companies to promote and coordinate private sector cooperation and technical exchange with India

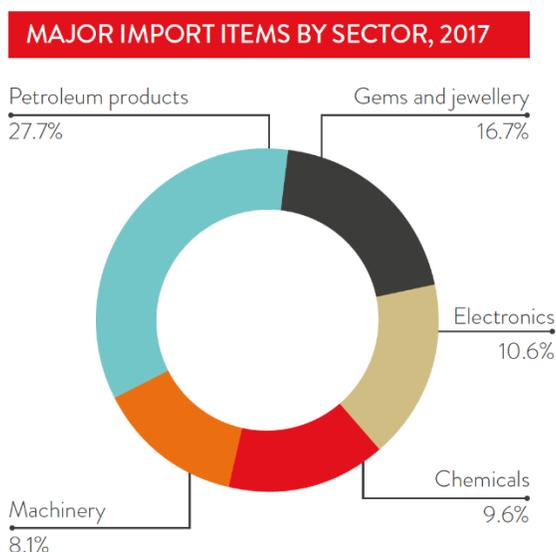
- Indian counterparts could be paired with Australian farmer cooperatives
- including with a focus on improving female participation in Indian cooperatives
- one focus for exchange should be on irrigation: industry-industry engagement is currently limited, noting Australia is hosting the World Irrigation Congress in 2020
- out to 2035, Farmer Producer Organisations and Companies in priority States could become useful engagement points, enabling engagement directly with suppliers and customers.

Challenges to implementing Australian technology in Indian Horticulture

Source – *Asialink Business*

Australia's economic relationship with India has expanded significantly in recent years – particularly exports of minerals and energy, as well as our provision of education services to tens of thousands of Indian students.

Two-way goods and services trade between Australia and India totaled AUD 27.4 billion in 2017. Major Australian exports to India included coal (AUD 9.2 billion), education-related travel (AUD 3.4 billion) and vegetables (AUD 1.38 billion). Australia's main imports from India were refined petroleum (AUD 1.6 billion), medicines (AUD 335 million), pearls and gems (AUD 274 million) railway vehicles (AUD 199 million). The total value of Australian goods exports to India for 2017 was AUD 15.7 billion, making it our fifth-largest goods export market. Australia exported an additional AUD 4.4 billion in services to India, a figure primarily made up of education-related travel services and other personal travel.



An important consideration point for Australian businesses exporting goods to India are the various import duties and taxes that may apply, including tariffs, and other import regulations with which they must comply. The terms tariff and ^{[[SEP]]}duty, although often used interchangeably, have quite distinct meanings.

A tariff is a tax applied on imports^{[[SEP]]} only, whereas duty is a tax that also applies to domestic products.

In India, tariffs are generally applied at a rate of 30 to 50 per cent on imported food products (calculated on the total cost including freight) and up to 150 per^{[[SEP]]}cent on foreign wines. When added to local sales taxes, distributor margins and on-ground transport costs, the retail sales price of wines can be up to three or four times the 'Fee on Board' value of an imported good.

Tariffs and import regulations are frequently revised and subject to change without notice, so businesses should reconfirm these before selling goods to India. There is also a broad range of import regulations that vary between industries and product types.

Central Board of Excise and Customs: Part of the Department of Revenue in the Ministry of Finance. It regulates import and export policy, including the levies, duties and taxes placed on importing goods into India. The applicability of taxes in Special Economic Zones is also legislated by this body. Indian Customs inspect all imported items to ensure that they are correctly labelled before allowing them to enter the retail market.

The Central Board of Excise and Customs also has powers to deal with counterfeit goods. Customs measures can be enforced on the imports of goods that infringe on others' copyrights and trademarks. Such 'infringing goods' are defined as goods manufactured, reproduced or traded in breach of IP laws within India or elsewhere, without the express permission of the person or organisation who owns the copyright or trademark. While their powers vary with different types of counterfeit products, customs authorities can usually fine offenders, seize goods or equipment and issue penalties. However, they do not have powers of arrest and cannot award compensation.

Import and Tariff duties: Negotiation of the Australia India Comprehensive Economic Cooperation Agreement (CECA) is underway and expected to conclude shortly. The trade negotiations aim to secure numerous benefits for Australian businesses, particularly those engaged in agriculture, manufacturing, services, investment, resources and energy. When CECA is signed and comes into effect, there may be certain goods to which no import duties apply. In other cases, import duties may be reduced for now, and eventually voided altogether by the end of a specified term, up to 20 years.

Import duties: A business planning to import goods into India from Australia should note that import duties will apply. These are calculated on either a quantity base – by applying an amount of duty per unit – or on an “ad valorem” (by value) basis – by applying an applicable set rate based on value. Import duty rates can be divided into two categories: general and preferential. General tariff rates apply to all imports, regardless of value, as there is no minimum threshold in India. Preferential rates apply according to any relevant bilateral or international trade agreements India is party to.

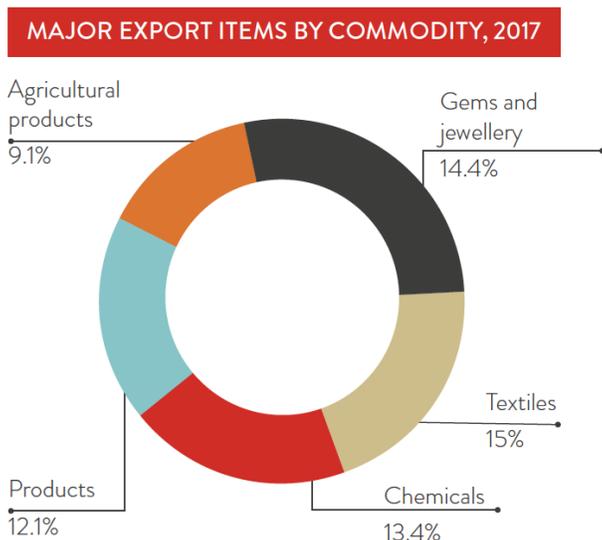
Additional taxes on imported goods: A range of customs duties and value added taxes apply to goods in India, although these may be reduced or not apply to goods imported through certain customs jurisdictions such as Special Economic Zones (SEZs). Additional taxes on imported goods include:

- Landing charge: One per cent of combined total of cost, insurance and freight (CIF)
- Countervailing duty (CVD): 0, 6 or 12 per cent of CIF + landing charge
- Education: Additional taxes including CVD
- Customs tariff: This varies greatly depending on the type of good. CBEC provides an online guide at <http://www.cbic.gov.in/>

- Value added tax (VAT): There is no VAT on goods imported into India but, depending on the type of product, a consumption tax may apply at the retail end, which can affect your margins.
- Goods and services tax (GST): A dual Central and State GST system will be applicable from 1 April 2017.
- Consumption tax (CT): This is applied additionally on luxury goods (at between 30 and 40 per cent, based on the maximum retail price) and wines and spirits (150 per cent).

Exports

India is currently Australia's 5th largest trading partner and its 5th-biggest export market. In 2017, Australia exported goods and services worth about AUD 20.16 billion to India, while our imports from India totalled over AUD 7.2 billion.



Attachment One

**Industry Training Concept
Proposal from J Farm**



Research and training on low cost modified hydroponics technology to improve the yield and profitability of small farmers growing sub-tropical and tropical vegetables in the warm humid coastal area



More production per inch of land & per drop of water

**J farm research centre
Tractors and Farm Equipment Limited**



Research and training on low cost modified hydroponics technology to improve the yield and profitability of small farmers growing sub-tropical and tropical vegetables in the warm humid coastal area

Contents

Executive summary

1. Background and Purpose
2. Major components of the project
3. Growing method, agronomic practices and expected yield
4. Location
5. On farm training
6. Cultivation techniques
7. Timeline for project
8. Financial summary
 - 8.1. Total cost of project (Three years)
 - 8.2. First year
 - 8.3. Second year
 - 8.4. Third year
9. Risk factors
10. References

Research and training on low cost modified hydroponics technology to improve the yield and profitability of small farmers growing sub-tropical and tropical vegetables in the warm humid coastal area

Executive summary

Protected cultivation in green/poly-houses is widely practised across India for growing specialty and high value tropical and sub-tropical vegetables under the Indo-Israel collaboration. It offers distinct advantages of increasing productivity of crops and quality. But the growers incur high cost on the installation of expensive structures like trusses, AC/heating systems and humidifier to regulate temperature and humidity, respectively, and lighting, exhaust fan, etc. Many a times the growers spend significant money for meeting the recurring cost on energy and this cost does not even match the sale price of the produce. For example in the hot humid coastal and a few inland areas, there is a small difference between the maximum and minimum temperature. The temperature inside the protected structures would abnormally increase in these regions if there is no temperature control as compared to what is prevailing outside. To overcome this problem, the growers run AC (in addition to ventilation) to reduce temperature prevailing inside the protected structures as compared to ambient temperature. This results in high cost incurred on the maintenance.

In our view, some of the equipment chosen for high temperature and humid climate is unsuitable or highly expensive for plastic tunnel/poly house structures. These equipment do not operate efficiently as opposed to using the same equipment in a hot, dry climate. This kind of infrastructure has condemned projects to failure from the start. For example, many such units that have come up with Government subsidies in Hosur, TN have become run into losses and have been closed down except for a very few floriculture units

The vegetables produced in the off-season under protected cultivation may fetch more price but those produced during the normal season generally do not fetch good returns due to large availability of these vegetables produced from the standard field planting without incurring of additional expenses on energy. This has also contributed to the woes of the farmers.

The protected cultivation also offer an ideal environment for proliferation of biotic agents like insects, fungi and vector transmitted viruses that force farmers to frequently apply pesticides. This poses severe health hazards to consumers but is under reported.

To overcome these problems, a new method of cultivation of tropical and sub-tropical vegetables known as modified Hydroponics has been developed and demonstrated at J farm agri research centre, TAFE. In this method, various vegetables such as tomato, chilli pepper, brinjal/aubergine, bush beans, snake gourd, ridge gourd, bittergourd and several leafy vegetables have been successfully raised in a special organic media filled up in running plastic trough of various sizes and UV treated bags. Irrigation is fully automated with drip and micro sprinkler and is gravity fed. In this system manifold increase in yield is recorded with minimum incidence of insect pests and diseases. This method of cultivation is done in open field and TAFE has sufficiently demonstrated that farmers'

profitability can be increased. The present proposal addresses the need to intensify this study with an important vegetable like tomato which has high relevance to both India and Australia

Modified hydroponics with automated drip irrigation system is an innovative low cost farming method to grow the tropical vegetables in the coastal area (Characterised by high temperature with high humidity) of Tamil Nadu and rest of India where there is neither very high (>40 deg C) nor freezing temperature (< 10 deg C). The installation cost of the modified hydroponics is Ca. 3.5-4 times cheaper than the installation of Hi tech greenhouse with fully automated system. The recurring cost of operations can be still be brought down by the farmers utilizing their own farm resources viz. vermicomposted cow dung and crop residue, using soil from his own farm and utilization of neem seed kernel extract to control the insect pests. Modified hydroponics technology can immediately help 7.5 m small and marginal farmers of Tamil Nadu to improve their productivity of subtropical and tropical vegetables and income by at least three to four times as compared to the traditional method of cultivation in the open field. The average yield of vegetables in Tamil Nadu is 30 t/ ha, above All India average but is still below international standards (Tamil Nadu agriculture department policy note, 2017-18). Modified hydroponics uses 90% less water than the traditional farming, decreases the vegetative growth time, prolongs the productive crop duration, and allows crops to be grown free from the use of chemical fertilizers and pesticides. Modified hydroponics is also a powerful tool which fits well into urban farming since it occupies less space

The cost of cultivation in this method is reduced by 30-40% since the intercultural operation is absent. Irrigation is also automated and no hard manual work is required. This technology is women friendly and could bridge the gender gap and increase agricultural productivity.

The technical programme of project for large scale confirmatory trial and to standardise on nutrients in the media for the transfer of technology is given in detail in the proposal. The activity consists of

1. Exploring the possibility of using different dimension of plastic trough and UV treated bags as per plant architecture
2. Refinement and estimation of nutrient content for the growing media (Composition of vermicompost obtained from dung & press mud, fully digested poultry manure, biochar and red soil, clay pellets fortified with biofertilizers and biofungicides, cocopeat etc)
3. Using of different concentrations of water extract of Neem (*Azadirachta indica*) Seed Kernel Extract (NSKE) and Pongamia seed (*Pongamia glabra*) to manage the insect pests
4. Effect of seed treatment (with inorganic and organic nano material) on the germination, vegetative growth and yield of crop, and
5. Automation of drip irrigation system under bio-mulch as per the requirements of crop
6. Assessment of yield and profitability as compared to conventional cultivation practices

7. On farm training in modified hydroponics technology to researchers, growers and entrepreneurs and unemployed youth in villages

This technology can also improve the livelihood of millions of poor farmers and contribute to the nutritional security of people in rest of the Indian states and in eastern, western and central Africa.

Tractors and Farm Equipment Limited can create an awareness of this technology to millions of small land holding (0.5-2.0 ha) farmers through their vast dealership network spread all over India and in many African countries. Tractors and Farm Equipment Limited, incidentally is well connected globally (100 countries) because of their iconic Massey Ferguson brand of tractors sold for the past many decades

Once standardized, this technology can be also adopted in coastal Australia (temperature varying between 22 and 48°C) viz. Northern Territory, South Australia and Victoria with fine tuning of technology to suit the locally grown vegetables.

Research and training on low cost modified hydroponics technology to improve the yield and profitability of small farmers growing sub-tropical and tropical vegetables in the warm humid coastal area

1. Background and Purpose

For ease of working and based on the availability of facilities, it is proposed to conduct further research and impart training to select farmers in Tamil Nadu for growing of sub tropical and tropical vegetable at J farm, TAFE, Chennai

If funds are forthcoming, simple infrastructure will be built for growing temperate and speciality vegetables like Coloured bell pepper, Broccoli, Brussels sprout, Asparagus, Leek, Kale, Collard, Turnip and fruits like Straw berry at either one of the TAFE owned Tea estates (Chamraj, Korakundah and Devebetta) in the highlands of Nilgiris district in TN. The technology will be showcased to highland speciality vegetable farmers and also supplied to star hotels under assured buy back arrangement

The number of operational land holders in Tamil Nadu is 8.12 m operating cultivable land of 6.49 m ha. Small and Marginal holders account for 92% of the total holdings operating 61% of the area occupied. The average size of the land holding in the State is 0.80 hectare which is 44% lesser than the average size of land holding of the country (1.15 hectare).

The coastline of Tamil Nadu has a length of about 1076 kms (Table 1), constitutes about 15% of the total coastal length of India and stretches along Bay of Bengal, Arabian Sea and Indian Ocean (Database on coastal information of Tamil Nadu, 2008)

Table 1. Coastal length of Tamil Nadu

Coastal districts	Coastal length (Km)
Chennai	19.0
Thiruvallur	27.9
Villupuram	40.7
Pudukottai	42.8
Thanjavur	45.1
Thiruvarur	47.2
Tirunelveli	48.9
Cuddalore	57.5
Kanyakumari	71.5
Kanchipuram	87.2
Tuticorin	163.5
Nagapattinam	187.9
Ramanthapuram	236.8
Total	1076.0

The standard per capita requirement of vegetables for adults is 300 g/day. But as per Tamil Nadu current production levels, 130 g/day alone can be supplied (Directorate of Horticulture and Plantation Crops, Agriculture Department, Government of Tamil Nadu). Modified hydroponics technology is one of the best for increasing the production and productivity of many vegetables. Due to health concerns, the importance of organic vegetable production is also growing in the State. Resorting to pest management with homemade botanicals especially neem is a lot more easier in this growing method

Tamil Nadu produces on an average 7.77 m t of vegetables annually. The average yield of vegetables in Tamil Nadu is 30 t/ ha (Tamil Nadu agriculture department policy note, 2017-18). It ranks next to Uttar Pradesh, West Bengal, Madhya Pradesh, Maharashtra and Karnataka at the National level. The major vegetables grown in the State are Chilli, Tomato, Brinjal, Okra, Tapioca, Cucurbits, Onion and Drumstick

The concept of hydroponics is essentially growing of crops in a medium of nutrient water under fully controlled environmental condition. This system is developed for areas where soil is not available for cultivation for a longer period of a year. For example, in US and Europe, chilling temperature prevails for more than seven months in a year. In these places establishing a controlled environment by suitably altering the temperature will help in crop production. In tropical countries this problem does not arise, since the soil is available for cultivation throughout the year. Moreover, in coastal area of Tamil Nadu where the temperature and humidity is high, establishing a completely automated controlled condition is very expensive since continuous energy is required to reduce temperature and maintain it at constant level. The installation cost of hi tech greenhouse with fully automated system and modified hydroponics with automated irrigation system is AUD 30.99-41.32/square meter and AUD 4.42-7.07/square metre, respectively.

The villages of Tamil Nadu are also beset with erratic power supply from the Tamil Nadu Electricity Board (TNEB). To ensure continuous power supply, generator has to run which adds up to the cost .

This proposal takes into consideration the inherent limitations in putting up costly infrastructure to raise vegetables in the coastal area which is characterised by high temperature and high humidity and poor performance of the existing the equipment i.e. pad and fan cooling systems for poly house structures. It also strives to improve the livelihood of marginal and small farmers through introduction of low cost advanced production technology for the tropical vegetables. This system can be installed with minimum investment and with less dependence on power and assures high productivity with best return on investment.

Many pilot trials have been conducted at J farm research centre for the past three years using specially prepared organic media filled up in plastic trough and UV treated grow bags for growing medium-deep rooted vegetables like Chilli pepper, tomato, bush beans. Brinjal/aubergine (egg plant) and cucurbits. In all the trials, we have observed considerable reduction in the cost of investment and manifold increase in yield.

But, standardisation on the following is to be done as a part of continuous improvement programme. These are

- Estimation of exact macro and micro nutrient content of the medium, organic carbon, pH of the medium and exact quantity of biofertilizers and biofungicides to be added.
- Estimation of the quantity of macro and micro nutrients and organic carbon depleted after the final harvest of each crop. This information is vital for topping up of medium after every cycle of crop grown in both plastic trough and UV treated bags

The results of pilot study indicated that cost of cultivation is reduced by 30-40% as the intercultural operation is absent. Automation of irrigation resulted in reduction of manual work. Water conservation was the biggest advantage since Cocopeat in the medium absorbed great volume of water and slowly released to the plants. This technology saved an incredible amount of water. It used as little as 1/20th the amount used in conventional farming. This technology is women friendly and helped to bridge the gender gap and increased productivity.

The technical programme of project for large scale confirmatory trial and to standardise on nutrients in the media for the transfer of improved technology is as follows

1. Exploring the possibility of using different dimension of plastic trough and UV treated bags as per plant architecture
2. Refinement and estimation of nutrient content for the growing media (Composition of vermicompost obtained from dung & press mud, fully digested poultry manure, biochar and red soil, clay pellets fortified with biofertilizers and biofungicides, cocopeat etc)
3. Using of different concentrations of water extract of Neem (*Azadirachta indica*) Seed Kernel (NSKE) and Pongamia seed (*Pongamia glabra*) to manage the insect pests
4. Effect of seed treatment (with inorganic and organic nano material) on the germination, vegetative growth and yield of crop
5. Automation of drip irrigation system under bio-mulch as per the requirements of crop
6. Assessment of yield and profitability as compared to conventional cultivation practices
7. Simultaneous on farm training to be imparted to researchers, trainers (extension functionaries), growers and entrepreneurs.

2. Major components of the project

The major components of project is tabulated below

Sl. No.	Major components	Description (Specification mentioned for each of the structure is tentative)
1	Crop growing structure	<p>Plastic trough (width: 30 cm, Depth: 30 cm, running length: As per the area of field, Thickness: 700 micron, Life: 10-12 years) – Suitable to grow the shallow rooted crop viz. Chilli, tomato, beans etc</p> <p>UV treated grow bags (Dimension 28 x 28 x 48 cm, life: 4-5 years) – Suitable to grow deep rooted crop viz. Brinjal, tomato and cucurbits</p> <p>The troughs and grow bags will be filled with growing media and crops are raised in this</p>
2	Growing media	<p>The growing media will be standardized on the basis of locally available best media to grow the plants in controlled condition by manipulating their nutrient content through organic inputs viz. biofertilizers, vermicompost etc.</p> <p>Growing media and bio inputs: Cocopeat, Vermicompost, Soil, Clay balls/pellets, Azospirillum, Phosphobacteria, selective strain of potash solubilizing bacteria, <i>Frateuria aurantia</i>, Vascular Arbuscular Mycorrhiza (VAM), <i>Trichoderma viride</i>, <i>Pseudomonas fluorescens</i> & Rock phosphate</p> <p>The major components viz. vermicompost can be produced by the Indian farmers in-house.</p> <p>Note: The aim is to maintain the following parameters in the growing media pH: 7, Organic carbon: >1.5%, Available nitrogen (N): > 350-450 Kg/ha, Available Phosphorus (P): > 18- 22 Kg/ha and Available potassium (K): > 200- 250 Kg/ha</p>
3	Weed mat	<p>The weed mat (100 GSM thick) will be spread on the top surface of the entire area to protect the growth of weeds and to prevent emergence of soil borne insects within the growing are.</p>

4	Automated drip irrigation system	<p>Equipment required for drip irrigation system include i) A pump unit to generate 2.8 kg/cm² pressure ii) Water filtration system – sand/silica/screen filters iii) PVC tubing with dripper or emitters</p> <p>For automation –Soil moisture sensors, GSM powered drip irrigation valve controller, irrigation solenoid valve, electromagnetic flow meter, digital pressure sensor</p> <p>Water output in drippers -1 6mm dripper at 2.8kg/cm² pressure gives 2.65 litres/hour (LPH) and 15 mm dripper at 1 kg/cm² pressure gives 1 to 4 litres per hour</p> <p>It will help in the precise delivery of water and water soluble organic fertilizers</p>
5	Bower system of training for cucurbits	<p>Minimises the incidence of foliar diseases since above ground parts does not come into contact with soil</p> <p>Improves the quality of fruit</p> <p>Easy to harvest</p>
6	Selection of growers for the training programme	<p>The selection of farmers will be done on following criteria</p> <ol style="list-style-type: none"> 1. Growers of tropical vegetables 2. Progressive farmers 3. Those urban entrepreneurs interested to install the modified hydroponics structure for growing vegetables <p>Target: 30 researchers, growers, entrepreneurs and unemployed youth per month</p>

3. Growing method, agronomic practices and expected yield

Option	Crops	Spacing or numbers of plants per bag (m)	Number of plants	Yield/ plant	Yield (t)
Growing in trough - 2000 m²	Tomato	0.9 x 0.6	3000	6.0	18.0
Growing in UV treated bags - Bower system - 1000 m²	Cucurbits	0.9 x 0.5 @ 2 plants/bag	4000	4.0	16.00
Growing in UV treated bags** – Deep rooted crops - 1000 m²	Brinjal	0.9 x 0.5 @ one plant/bag	2000	3.5	7.0

4. Location

For sub-tropical and tropical vegetables

J farm research centre, Tractors and Farm Equipment Limited,
Pudupakkam, Kelambakkam 603 103, Tamil Nadu, India.
Total new area to be allocated: one acre or 4000 sq m

For temperate vegetables (subject to approval by Chairman)

Chamraj Tea Estate, Nilgiris district, 643 204, Tamil Nadu

5. On farm training

Location: J farm research centre, Tractors and Farm Equipment Limited, Pudupakkam,
Chennai – 603103, Tamil Nadu, India

Training period	Between second and third year
Districts to be covered	Chennai, Thiruvallur, Villupuram, Cuddalore, Kanchipuram, Thanjavur
Number of growers per batch	10 numbers
Training duration per batch	5 days
Total number of growers to be trained from selected districts	720 @ 30 numbers/month
Number of growers to be trained from each district	120

6. Cultivation techniques

The selection of growing structure and growing media will be decided on the basis of plant architecture, root growth pattern, crop duration, type of crop and requirement of nutrient during the crop period.

Option1. Cultivation of Tomato in plastic trough

Option 2. Cultivation of cucurbits viz. ridgegourd, spongegourd, snakegourd, bittergourd, cucumber, bottlegourd in UV treated grow bags (Bower system)

Option 3. Cultivation of deep rooted vegetables viz. Brinjal (Egg plant) in UV treated grow bags (without bower system)

Option 1. Growing of vegetables in plastic trough – Fig 1

Size of trough (cm): 30 (Width) x 30 (Height) to grow **tomato**, chilli (green & red), beans
Spacing: Between trough to trough: 90 cm, Between plant to plant: 30 cm



Fig 1. Tomato grown in plastic trough

Option 2. Growing of cucurbits in UV treated grow bags (Bower system) - Fig 2

Crops: Ridgegourd, snakegourd, bittergourd, bottlegourd etc

Spacing: Between two bags: (Row to Row: 90 cm and Plant to plant: 50 cm)



Fig 2. Cucurbits grown in UV treated grow bags (Bower system)

Option 3. Growing of deep rooted vegetables in UV treated grow bags (without bower system) - Fig 3

Crops: Brinjal, okra, tomato (one plant each bag), beans (2 plants/bag)
(Row to Row: 90 cm and Plant to plant: 50 cm)



Fig 3. Brinjal (Egg plant) grown in UV treated grow bags

7. Timeline for project

Work plan	Time line
Main experimental plot located at J farm research centre, TAFE	
Appointment of staff and Procurement of infrastructure material, agri inputs	First year
Selection and development of land	First year
Installation of structure to start the experiment and standardisation of suitable growing media	First year
Direct sowing of cucurbits and raising of nursery for brinjal & tomato, Transplanting of seedlings tomato (21 DAS) and brinjal (45 DAS) in the plastic trough and grow bags, recording of data on vegetative growth, yield, quality, requirement of water, incidence of insect pest & its control by application of neem seed kernel extract (NSKE) and retailing of vegetables through farm gate	First year
Analysis of growing media to assess the impact of crop on the pH and nutrient content of growing media, cost benefit ratio	First year
On farm training to selected growers from Chennai, Thiruvallur, Villupuram, Cuddalore, Kanchipuram, Thanjavur districts of Tamil Nadu	
Selection of growers	Second year
Training to growers as per the point no. 5.2	Second & Third year
Submission of report to funding agency	
Grow the selected crop in three successive season to validate research data and submit the report each year and report on training programme from second year	Between first and third year

8. Financial summary

1. Total cost of project (Three years)

Heads	Expenses/year (AUD)			Total (AUD)
	First	Second	Third	
Capital	91319.58	0	0	91319.58
Operational	164617.81	93621.5	93621.5	351860.81
Personnel	99719.66	99719.66	99719.66	299158.98
Activity	0	28202.31	28202.31	56404.62
Grand Total	355657.05	221543.47	221543.47	798743.99

2. First year

Material and inputs	Total cost (AUD)
A. Capital expenditure	
Plastic trough (500 micron thickness)	34241.09
UV treated grow bags (28 x 28 x 48 cm)	7929.52
Weed mat (100 GSM thickness)	9461.35
Automated micro irrigation main station with drip and underground PVC lines	35042.05
Installation of bower system (Granite or cemented pole 110 @ Rs. 250/unit, materials viz, cement, granite chips and sand for grouting the pole @ Rs. 100/ pole, Agroline (wire)- 20 kg thickness 3.5 mm @ Rs. 250/kg & 60 kg thickness 2.0 mm @ Rs. 250/kg to create bower system, GI wire (200 kg of 8 mm thickness) at boundary and support to poles @ Rs.100/kg	3143.77
Laptop with printer – to record the field observation data, data analysis and communication via mail etc	1501.80
Total	91319.58
B. Operational cost	
Cocopeat (8.0 + 4.32)	15541.85
Vermicomposted press mud (78 + 34.68)	28429.48
Soil (78 + 34.68)	7919.60
Hydrotone - Light Expanded Clay pebbles (80 + 160)	1441.73
Biofertilizer(each 13 lit/kg Symbion N, Symbion P, Symbion K, VAM) (312 lit/kg + 144 lit/kg)	12600.72
Biopesticide and bio fungicides (each 13 lit or kg -Biocure F, Biocure B) (156 lit + 72 lit)	6163.40
Soluble micro nutrient (25 + 50 lit)	4505.41
Neem seed kernel (500 + 400 kg)	2162.60
Miscellaneous – Staking wire/rope/stick, nail, GI wire, hiring of JCB for the mixing of media and man power for installation – For Grow bag	6007.21
Miscellaneous – Staking wire/rope/stick, nail, GI wire, hiring of JCB for the mixing of media, Man power for the installation of trough, preparation & filling of media etc – Plastic trough	9010.81
Seeds of different types of vegetables per year	3003.60
Farm worker for the crop management viz. sowing, irrigation, plant protection, harvesting etc (@ 4 male farm worker and 2 female farm worker	54815.78
Cost and maintenance of submersible pump	1001.20
Office rent (For four executives) – Space required: (15' x 15' or 225 sqft area) – Inclusive of electricity and communication etc	12014.42
Total	164617.81

C. Personnel cost	
Agronomist - 1	24028.83
Entomologist – 1	24028.83
Agriculture extension officer- 1	24028.83
Agri Engineer – 1	12014.42
Field assistant -2	12014.42
Accountant -1	3604.33
Total	99719.66
Grand total (A+B+C)	355657.05

3. Second year

Material and inputs	Total cost (AUD)
A. Operational cost	
Cocopeat (1.6 + 0.86)	3103.32
Vermicomposted press mud (15.6 + 6.94)	5686.90
Soil (15.6 + 6.94)	1584.10
Biofertilizer(each 13 lit/kg Symbion N, Symbion P, Symbion K, VAM) (62 lit/kg + 28.8lit/kg)	2509.09
Biopesticide and bio fungicides (each 13 lit or kg -Biocure F, Biocure B) (31.2 lit + 14.4 lit)	1232.68
Soluble micro nutrient (25 + 50 lit)	4505.41
Neem seed kernel (500 + 400 kg)	2162.60
Miscellaneous – Staking wire/rope/stick, nail, GI wire, hiring of JCB for the mixing of media and man power for installation – For Grow bag	1001.20
Miscellaneous – Staking wire/rope/stick, nail, GI wire, hiring of JCB for the mixing of media, Man power for the installation of trough, preparation & filling of media etc – Plastic trough	1001.20
Seeds of different types of vegetables per year	3003.60
Farm worker for the crop management viz. sowing, irrigation, plant protection, harvesting etc (@ 4 male farm worker and 2 female farm worker	54815.78
Cost and maintenance of submersible pump with electricity charges	1001.20
Office rent (For four executives) – Space required: (15' x 15' or 225 sqft area) – Inclusive of electricity and communication etc	12014.42
Total	93621.5
A. Personnel cost	
Agronomist - 1	24028.83
Entomologist – 1	24028.83
Agriculture extension officer- 1	24028.83
Agri Engineer – 1	12014.42
Field assistant -2	12014.42
Accountant -1	3604.33
Total	99719.66

B. Activity cost	
Travel cost towards the selection of village and farmers for the training programme from 6 districts of Tamil Nadu (inclusive of boarding, lodging and local travel) - 1 person per trip	1922.31
Travel cost towards the training of 360 growers/year (inclusive of travel, boarding, lodging, training material @ AUD 73 /grower)	26280
Total	28202.31
Grand total (A+B+C)	221543.47

4. Third year

Material and inputs	Total cost (AUD)
A. Operational cost	
Cocopeat (1.6 + 0.86)	3103.32
Vermicomposted press mud (15.6 + 6.94)	5686.90
Soil (15.6 + 6.94)	1584.10
Biofertilizer(each 13 lit/kg Symbion N, Symbion P, Symbion K, VAM) (62 lit/kg + 28.8lit/kg)	2509.09
Biopesticide and bio fungicides (each 13 lit or kg -Biocure F, Biocure B) (31.2 lit + 14.4 lit)	1232.68
Soluble micro nutrient (25 + 50 lit)	4505.41
Neem seed kernel (500 + 400 kg)	2162.60
Miscellaneous – Staking wire/rope/stick, nail, GI wire, hiring of JCB for the mixing of media and man power for installation – For Grow bag	1001.20
Miscellaneous – Staking wire/rope/stick, nail, GI wire, hiring of JCB for the mixing of media, Man power for the installation of trough, preparation & filling of media etc – Plastic trough	1001.20
Seeds of different types of vegetables per year	3003.60
Farm worker for the crop management viz. sowing, irrigation, plant protection, harvesting etc (@ 4 male farm worker and 2 female farm worker	54815.78
Cost and maintenance of submersible pump with electricity charges	1001.20
Office rent (For four executives) – Space required: (15' x 15' or 225 sqft area) – Inclusive of electricity and communication etc	12014.42
Total	93621.5
B. Personnel cost	
Agronomist - 1	24028.83
Entomologist – 1	24028.83
Agriculture extension officer- 1	24028.83
Agri Engineer - 1	12014.42
Field assistant -2	12014.42
Accountant -1	3604.33
Total	99719.66

C. Activity cost	
Travel cost towards the selection of village and farmers for the training programme from 6 districts of Tamil Nadu (inclusive of boarding, lodging and local travel) - 1 person per trip	1922.31
Travel cost towards the training of 360 growers/year (inclusive of travel, boarding, lodging, training material @ AUD 73 /grower)	26280
Total	28202.31
Grand total (A+B+C)	221543.47

9. Risk factors

There is minimum risk during the implementation of the proposed research project.

Tractors and Farm Equipment Limited (TAFE) is a tractor major based at Chennai, with a heritage of serving farmers offering total farm solutions since 1961. It is the world's third largest tractor manufacturer with a range of tractors and related farm equipment coupled with its own adaptive research farm viz., "J" farm. J farm and its exclusive agri portal www.jfarmindia.com are an invaluable input for improving farm production and productivity.

With close to 54 years of experience in Indian farms and agricultural practices and extensive associations with leading agri universities and agri research institutions, it has been facilitating lab to farm transfer of agricultural practices and has to its credit a number of successes in working independently and with government agencies in releasing new and improved varieties of seeds to meet the burgeoning food needs of India. J farm research centre is also working with Farmers of East and west Africa viz. Ethiopia, Ivory Coast, Zambia, Lesotho & Sierra Leone to improve their productivity and livelihood

J farm research centre has well qualified scientist (Agronomist, Entomologist, Agri Engineers) and qualified graduate from IIM, Ahmedabad. They have work experience between 3 and 44 years in agricultural research, extension work. They can handle any agri business related projects successfully.

J farm research centre is located in the coastal area of Kanchipuram, Tamil Nadu. It is an ideal location to carry research work on modified hydroponics technology with no risk.

Tractors and Farm Equipment Limited is well connected to Indian farmers through extensive dealership across the country and also globally with millions of small and marginal farmers. It will be easier for TAFE to conduct demonstration in select growers field once specification is standardised.

10. References

Directorate of Horticulture and Plantation Crops, Agriculture Department, Government of Tamil Nadu (<http://www.tnhorticulture.tn.gov.in/horti/vegetables>)

Ramesh R, Nammalwar P and Gowri V. S (2008). Database on coastal information of Tamil Nadu. Environmental Information System (ENVIS) Centre, Department of Environment Government of Tamil Nadu, Chennai – 600 015

Tamil Nadu Agriculture Department Policy Note (2017 – 18) Demand No. 5 page 138

<http://iomenvis.nic.in/index2.aspx?slid=1938&sublinkid=224&langid=1&mid=1>

Attachment Two

Water recycling project Proposal form Charles Devenish

CLEARFORD

Clearford India Private, Ltd
A001 Bhatnagar Avenue Apts,
Viman Nagar, Pune,
411014

Tel: +91 99606 45684
E-mail: sdeshpande@clearford.com

GeoMysore

Jonnagiri & Pagadri Village Proposal

Introduction:

The villages of Jonnagiri and Pagadri are located in a semi-arid part of Andhra Pradesh with a steppe type climate. Rainfall in the area during a good monsoon is less than 600mm (<23.5 inches) the vast majority of which falls during the three month monsoon period. Bad or variable monsoons are common especially in these days with climate change disrupting rainfall intensity and duration.

In order to ensure self-sustainability for the village population in the vicinity of the mine we at Clearford India Pvt. Ltd. suggest that all the domestic wastewater being generated daily be captured, treated and recycled. This will create a pool of water that is available daily with some variation (decreasing in the summer months and increasing during the monsoon) that can both be used for growing crops as well as utilized in the mining operation itself.

Ninety percent plus of the Jonnagiri and Pagadri village households today have both toilets and bathrooms built on their own or under the Government of India's Swaach Bharat scheme. As a part of this project we propose to build for the remaining homes both toilets and bathrooms to ensure that both villages gets ODF (Outdoor Defecation Free status). Based on our experience elsewhere in India we can expect health improvements amongst the villagers as the sewerage of the village will eliminate contact with both the greywater and in some areas mixed sewage flowing through the village stormwater drains into the village pond as well as the sewage soaking into the ground and eventually also ending up in the pond itself. This reduction in contact will benefit the youngest and oldest members of the village especially as their immune systems tend to be the weakest. In addition, reduction in illness has an immediate impact by reducing medical expenses and therefore increasing available disposal income. Reduce illness amongst children also translates into a better education as school absences reduce.

As per the latest data available the village of Jonnagiri has a population of approximately 12,500 living in 2500 households while Pagadri has a population of approximately 2300 living in 460 households. Water usage in rural Andhra Pradesh as across most of rural India averages 70 LPCD (Litres per Capita/Person per Day). In the case of the two villages the amount of water available after treatment daily can therefore be calculated as follows:

Population x 70LPCD x 85% (amount of water consumed that becomes wastewater) = wastewater generated daily

Village	Population	Water Supply	Wastewater %	Wastewater Daily (Litres)	Wastewater Annual (Litres)
Jonnagiri	12,500	70 LPCD	85%	743,000	271 Million
Pagadri	2,300	70 LPCD	85%	136,000	49.6 Million

The above estimated wastewater generation rates suggest that not treating the wastewater is both a terrible waste of scarce resources and a health hazard. For the planned mine it is as well as a huge opportunity.

We therefore propose that the villages be seweraged in phases as per fund availability as a part of the mines Corporate Social Responsibility and the treated water be used for:

1. Growing crops using drip irrigation and the latest scientific techniques to supplement and improve the villagers diet.
2. Mine operations reducing daily input water purchase costs.

Capital Costs:

As both projects will require a significant fund outlay to do to 100% coverage, it is possible to do both villages in Phases as per fund availability. One note at this stage Capital costs can only be given in a range as a mapping exercise and contour survey is required to generate a high level of accuracy. Factors that can impact price at the two villages:

1. Upto 4 houses can be connected to a single Digester depending on the layout of the village. As a price of a Digester remains largely the same this can lead to significant savings.
2. If the STP is built to full capacity it can reduce the overall STP construction price by upto 30% versus a modular STP.

The estimated cost range inclusive of GST of the villages is as follows:

Village	Households / Population	Minimum Price (INR)	Maximum Price (INR)	INR Price per Litre (10yrs)	INR Price per Litre (20yrs)
Jonnagiri	2500/12,500	15Cr.	25Cr.	0.055 – 0.092	0.027 – 0.046
Pagadri	460/2300	3Cr.	4.6Cr.	0.060 – 0.092	0.030 – 0.046

Operation & Maintenance Costs:

The significantly lower O&M costs of the Clearford One sewer system proposed here are distributed between all the beneficiaries as follows:

1. **Household level Digesters:** these typically will have to be emptied of their contents once every 5 – 10 years with the cost being divided between the households connected to the specific Digester. The emptied sludge while mostly inorganic can be mixed into the soil in nearby fields to improve its quality.
2. **Pipe Network:** Requires no maintenance except in the unlikely case that there is a pipe break. In the case of a break, after repairing the affected section of the pipe will have to be flushed with water.
3. **STP and STP Pump Station:** The major recurring costs at the STP come from three sources:
 - I. **Electricity** to operate the pump stations that lift the sewage from the underground pipe network to the STP inlet. This can be reduced to near zero through the installation of a solar pump set in which case the only costs that will be incurred are for the maintenance of the solar panels and battery replacement.
 - II. **Manpower:** The STP should not require more than one person per shift to operate.
 - III. **STP Bacterial recharge:** To ensure adequate performance of the STP it is recommended that once every 3 years or so a fresh load of bacteria be mixed into the STP raw water tank to recharge the STP itself. The cost of this comes to approximately Rs. 1000/1000L.

Attachment Three

INTERNATIONAL CENTRE FOR EXCELLENCE IN HORTICULTURE AN INDO- AUSTRALIAN JOINT VENTURE (Autonomous Institute in skill development)

OBJECTIVES:

1. To train entrepreneurs, scientists, agriculture graduates in the State of Art high tech horticulture production under retractable roof technology of production, supported by Priva fertigation systems. With 50% seats going for those who have confirmed project on hand to start/DPR prepared.
2. To train and demonstrate the technology to increase production in select horticulture crops by 5 times compared to open cultivation practices and results.
3. To demonstrate to the commercial world that high tech, high investment horticulture is highly profitable.
4. To support the entrepreneurs who plan to start a project from start to end conceptualization, planning, crop selection, vendor selection, project plan, funding through banks, turnkey execution and ongoing support for growing with fortnightly audit of the growing practices, marketing and sales.
5. After a couple of years the ICEH (International Centre for Excellence in Horticulture) the centre would accept trainees from other countries also
6. To offer job opportunities for the trained in new high tech projects in India and other countries as campus placement.
7. To have a tie up with an Australian Agriculture University for a certification and diploma

Scenario in India

Presently Indian agriculture is practiced mainly in open, on fragmented lands, with very low investment, mostly without irrigation and depending on rains and with very low technology and professionalism. Owing to smaller size and incapability to invest, agriculture today has proven itself as definitely a loss making venture. Many agriculturists are planning to quit farming, added to that the next younger generation is leaving villages and farms to cities in search of livelihood. There is a strong need to change this scene. The need of the hour is consolidation of land into large tract, move agriculture into corporate sector, offer highly paid jobs to the farmers who will be stake holders in the corporate.

PROMOTERS AND FOUNDERS

In this direction our Centre of Excellence is taking a step supported by Govt of Australia, corporates like Cravo Technologies Ltd and Priva technologies Ltd etc. The founding fathers of this concept are Mr. Tony Bundock, Director Genesis Horticultural Solutions and Mr Stephen Manallack Former President, Australia India Business Council. The program is being ably supported by Mr. A S Patil who is a post-graduate in Horticulture, with 40 years' experience in horticulture project consultancy, Business Management and is a professional qualified trainer in andragogy with special reference to horticulture & project finance. He is a trainer for agri graduates for AC&ABC program of Govt of India, faculty at National Institute of rural banking, a training institution for bankers in agriculture and rural banking. Has a fairly good exposure to law and legal aspects connected with agri projects.

MINISTRY OF SKILL DEVELOPMENT, GOVT. OF INDIA (msde.gov.in)

Govt of India under the dynamic leadership prime Minister Narendra Modi has announced Pradhan Matri Kaushal Vikas Yojana(PMKVY) which translates as Prime minister's skill development program is the flag ship scheme of Ministry of Skill Development & Entrepreneurship (MSDE). The objective of this skill Certification Scheme is to enable a large number of Indian youth to take up industry relevant skill training that will help them in securing a better livelihood. Individuals with prior learning experience or skills will also be assessed and certified under Recognition of Prior Learning(RPL).Under this scheme, training and assessment fees are completely paid by the Government.

This program or training supports other objectives of Govt of India:

1. to double the farm family income by 2023.
2. Save water program.
3. To improve FOREX reserve for India due to export of produce quality produce

COURSE CONTENT

The course content will focus on

1. Retractable roof technology of greenhouses which saves power, effective in round the year production, effective in production of crop under harsh tropical climates, saves water. Produces crop with very low pesticide residue levels which are considered near organic.
2. Priva irrigation/fertigation systems
3. NFT under hydroponics
4. Vertical farming
5. Deep water hydroponics
6. cultivation under different media like cocopeat, rock wool etc
7. technology of growing, microclimate management
8. vision and business plan and economics of the project
9. hands on training for a period of 6 months
10. Automation

FEE STRUCTURE

The program shall work on a profit centre model which means the working expenses OPEX will be funded by the fee collected entirely and generate surplus for any R&D and or expansion.

A course fee of INR 100000 per month is proposed. Hence a trainee will have to pay INR 600000/ for a course of 180 days in advance.

In addition he will pay towards hostel charges of INR 20000 per month/trainee which totals to INR 120000 for 6 months program.

A course will have 25 trainees and will fetch a fee of INR150,00,000/

Visit to farms in Australia for 15 days cost airfare INR 90,000, boarding, lodging INR 75000 per trainee.

Total fee per trainee:

Fee : INR. 600000

Hotel : INR. 120000

Visit : INR. 165000

Regn : INR. 15000

TOTAL: INR. 900000

OPEX are given below:

Sl No	Description	Receipt INR	Payments INR	SURPLUS
1	Fee received for program of 6 months Hostel charges collected Visit to farms in Australia 15 days Regn, certificate @ INR 15000	1,50,00,000 0,30,00,000 0,41,25,000 0,03,75,000		
2	Faculty 180 days X INR 20000 per day 3 Directors fee for 6 months		036,00,000 100,00,000	
3	Nutrients, pesticide for 2 acre GH		004,00,000	
4	Labor 12 X INR 250X 180 days		005,40,000	
5	Power		000,50,000	
6	water		000,50,000	
7	Travel		004,00,000	
8	Hostel expenses for faculty		000,60,000	
9	Hotel expenses for trainees including salary of employees in hostel and admin and opex		027,00,000	
10	Stationery, certification		005,75,000	
	TOTAL	1,83,75,000	183,75,000	
11	Visit to Australian farms 15 days including airfare, boarding and lodging	0,41,25,000	041,25,000	
	SURPLUS			nil

CAPEX

Project: area 2 acres Green house

Sl no	Description	Amount in INR
1	One acre X Frame Cravo GH	1,60,00,000
2	One acre flat roof Cravo GH	1,20,00,000
3	Electrical cabling	0,05,00,000
4	Genset	0,06,00,000
5	Fertigation unit Priva	0,25,00,000
6	Drip system with arrow drippers	0,06,00,000
7	Bags for cultivation	0,05,00,000
8	Coco peat	0,09,00,000
9	Rock wool	0,09,00,000
10	Office building 500 sq ft, training hall 500 sq ft	0,12,00,000
11	Hostel rooms twin sharing plus rooms for faculty 20 nos, 4000 sq ft including corridor	0,48,,00,000
12	Borewells 3 nos with IP sets	0,03,00,000
13	transformer	0,05,00,000
14	Storage tank syntax for hostel	0,01,00,000
15	PVC main/sub lines	0,01,00,000
16	car	0,06,00,000
17	Import custom duty @ 30 %	0,96,00,000
18	Local transportation from port to site	0,10,00,000
19	GH erection charges	0,22,00,000
20	equipments	0,10,00,000
	TOTAL IN INR	5,59,00,000
21	Pre operative expenses and contingencies	75,00,000
	TOTAL IN USD	8,45,333

The project requires 5 acres land and cost if purchased will be INR 1,00,00,000 approximately.

Conversion, registration would cost INR 10,00,000/
IN USD 146,666/

Special purpose vehicle: we have to register a trust for this purpose and land has to be purchase by one of the trustees and transferred to trust or to be purchased by trust itself (needs legal stand).

If the activity is treated as educational institution, then it has to be trust and not a company as per local legal framework.

TASKS AND ROLE RESPONSIBILITY

1. Finalisation of business plan given above, forming a Trust after finalizing name for TRUST. Mention the trustees.
2. Funding agencies to be decided for CAPEX of USD 10,00,000. Like priva, Cravo, Govt of Australia etc
3. Obtain GOI, Ministry of Home affairs permission for inward remittance from abroad
4. Approach Govt of Australia, Univ. of Australian agri university for association and certification
5. Decide on how to own land, whether GOI will procure and deliver or purchase to happen from trust. If it is purchase from trust necessary exemptions to be obtained from Govt of Karnataka under land reforms Act 1973.
6. Execution process. Buildings, GH construction. After 6 months of commencement of construction we can approach agri universities for Trainees, we can go for newspaper advertisement.
7. Approach a few banks for educational loans for needy.

All tasks will be monitored by A S Patil.

Attachment Four

An Up-Skilling Initiative for the Indian Protected Cropping Industry

CV Prakash, CEO, Hydroponic Greenhouse Technologies India Private Limited (HGTIPL)

Purpose: The Project's aim is to address a significant market failure in India's protected cropping industry by developing a Premier Training Institution which offers a comprehensive training program for delivery to all growers. India has great resources to operate among the best in the world in terms of protected cropping. However, the knowledge base on protected cropping is woefully low. We do not enjoy the presence of well designed and equipped institutions in our country that can actually train skilled manpower and equip them with the experience and knowledge required to successfully operate CEA (Controlled Environment Horticulture). Growers lack access to the right technologies and training opportunities that has the capacity to significantly lift our productivity and quality. This paper is developed and presented exactly to address this gap to meet the commercial growers need to up-skill and improve their farms viability and thus be of use to this industry. With 51 percent FDI in retail announced by the Government recently retail magnates from around the world like Wal-mart, TESCO and Carrefour et al are going to make a big entry into India. The catch is that these companies will insist on high quality, reliability and consistency of supply throughout the year and will be very choosy when it comes to approving vendors. With the present conditions that prevail in India we as a country fall woefully short in its ability to meet these lofty ideals and standards. However what is India's greatest challenge is our greatest opportunity as it will help us lift our standards to world class levels and help us even addresses International markets.

Funding Sources and Partners:

HGTIPL is looking for sources of funding to set up a world class Centre of Excellence in Controlled Environment Horticulture in India, with equity participation.

Summary

Hydroponic Greenhouse Technologies India Private Limited is India's Pioneer and full spectrum Hydroponics/Soil-less cultivation company with its demonstrated and practically proven might in the field of Simplified and Commercial Hydroponics Training in India since Oct 2008. The founder is Lt Cdr (retd) CV Prakash, the Chief Visionary of this dream for India. He studied the science of Hydroponics/Soilless Cultivation in Australia where this practice of growing is significant considering that this is the driest continent on earth with very limited amounts of water. He was instrumental in creating a JV for an Australian company called Globalhort and Casetech Australia, based in Melbourne and acted as a consultant for the same and is a RHP Holland Certified facility. Ms Sangeeta Bojappa, a Human Resources professional and from a family of Coffee planters, is the Co-Founder and Chief Operations Officer. Since inception HGTIPL (erstwhile ISH-Institute For Simplified Hydroponics) has spearheaded and spread awareness to more than 4500 students from within India and abroad by way of training and recently even done short courses for those aspirants of Controlled Environment Horticulture- CEH). HGTIPL is also in to setting up turnkey CEH Greenhouses for Hydroponic Cultivation. It has successfully

done three major projects, two in India and one in Africa. In addition HGTIPL has years of experience in Agronomy and offers such support. It has proven on ground by own example that Hydroponic produce can be grown in India and even sold to large format retail chains like Wal-Mart In Bangalore India. It has even achieved the unique distinction of being allowed to sell its signature spinach to Wal-Mart under its unique “Pet Bharo”, (Pronounced PateBurrow” which means “Fill Your Stomach” in the national language of India which is Hindi) brand name that is now the top Hydroponic Brand in India. No single company in India has the credentials that HGTIPL has built brick by brick through sustained hard work and persistence and a will to change India’s horticultural landscape.

HGTIPL also represents exclusively/non-exclusively the following companies around the world:

- Clean Grow Ireland- Multi-Ion Probes • CalcClear Investments Pty Ltd, Australia • Smart Pro Israel- Irrigation Software • Bluelab New Zealand- pH/EC probes • IISH USA – Simplified Hydroponics • City Hydroponics USA- Urban Roof Top projects • BK Greenhouses South Korea- Commercial Greenhouses • A&B Hydroponics Australia- Commercial Greenhouses with Vertical Growing • Partners with NEC Japan’s- CSR Program in India • Partners with GRNECO- for Biomass Energy For Greenhouses

HGTIPL has several top notch experts and resources in Hydroponics from around the world on its panel for immediate help and support as the case may be.

Business Verticals

The following are our business verticals:

- Training in Simplified Hydroponics • Training in Commercial Hydroponics • Consultancy for Commercial Hydroponic Greenhouse Projects • Managed Services for Clients Greenhouses • Agronomy Support for clients • Audits of Cultivation procedures and GAP certification support • Nutrient Manufacturing • Animal Fodder Systems • Coco Peat substrate supplies • Urban Roof Top Turnkey Projects • Supplies of Instrumentation for Greenhouses • Setting up of Commercial Hydroponic Food Parks • Marketing Support for Growers • Post Production and Post-Harvest consulting and turnkey support.

HGTIPL’s Study

HGTIPL has understood from its survey of growers’ in India, that, a common theme running through the prevailing protected cropping industry was a lack of training and skilling options for all levels of participants. Our review of the industry explored market failures and constraints to industry development. This review resulted in identification of around 19 issues that urgently require attention, with the number one common issue identified as a lack of skills training opportunities.

There are currently no schools in India to industry pathways (to encourage horticultural students by practical training to pursue careers in our industry), industry career pathways or specific hydroponic production modules (units & competencies) within the University/College curriculum framework. There never has never been nor there exist

today any support for grower skilling that has the capacity to lift the entire industry. At the maximum there are “Consultants” with only knowledge of agricultural theory for Growers, who claim that they know it all, but fail to deliver results unfailingly. It’s important to know that more important than “Know-how” is “Do How” and practically “Show How” and this where HGTIPL has a unique offer for India. Knowledge without practical experience means nothing. It is the application of that which has been learnt that means attaining tangible results.

HGTIPL consulted industry participants to perform a needs and gap analysis and have developed a program for research, produced training units & competencies for stakeholders to achieve this goal of being globally competent. HGTIPL initially will be giving the training and competency certifications to students of their courses and will finally want to have these accreditations approved by agricultural universities and Ministries of Agriculture both at the Centre as well as individual states.

A compelling argument for adoption of this project is that without basic skills training in specialized horticultural subjects (e.g. plant physiology, environmental management, etc), no amount of new or existing technology, chemical or fertilizer regimes, integrated pest management strategies or new varieties or cultivars, etc will change or enhance the growers productivity or viability. Skills training at all levels are seen as absolutely necessary to underpin industry development & growth.

Currently growers are required to travel to overseas training institutions (most notably to Israel) to receive tuition in this specialized area, and at significant cost and additionally our growers operate in a highly fierce and competitive national and global economy with competition from big local growers and nations that have access to full training programs at all levels.

The Centre for Excellence

The project is aimed to address a significant market failure in the protected cropping industry by developing a comprehensive training program for delivery to all greenhouse or hydroponic growers.

It is a national imperative that access is provided in all states to ensure that training and accreditation is developed to meet the growing needs of the protected cropping participants and the needs of their staff.

The current lack of formal training was addressed at all levels from workers to supervisors to managers in horticultural production, as well as development of a pre-employment program targeted at new industry entrants.

One initiative is the development of a 'Greenhouse Certification’ to record grower accreditation levels that could be transferable across different CEH workplaces or employers.

It is an imperative that that production and quality increases are necessary to meet the increasing demands of QA systems for both domestic and export markets. Industry

skilling has the capacity to meet these needs and match the standards of the competitive imports/exports. Improved productivity also enhances the industry to the wider horticultural community resulting in overall growth through increasingly attracting new entrants.

Some expected benefit/consequences of this work are a significant lift in grower productivity and viability with a concomitant decrease in cost of production through improved production techniques. Improved techniques should translate into enhanced production and quality that satisfies the QA requirements of both domestic & export markets leading to enhanced market opportunities.

The target audience for HGTIPL is all growers in the protected cropping industry with no or little formal horticultural training in their field. We wish to encourage growers to lift standards necessary to meet market & QA expectations through improved education.

The success of a Centre of Excellence for CEH will ultimately be proved by increased lift in production per m² (standard measure used worldwide to compare production systems and individual growers), as well as increased uptake of product by consumers.

Through time, qualitative & quantitative data can also be accessed through the main grower distribution markets in all major capital cities. Grower feedback can be sought to assess pre & post production levels per m² with an industry database developed to track grower accreditation levels and production improvements.

It is proposed that regular consultation with the various private and public institutions in India be done to make this project as successful as possible.

Industry Consultation

HGTIPL has through formal and informal meetings and discussions with small and large stakeholders in India, come to the conclusion that a Centre for Excellence in CEH is imperative if our growers are to achieve success both in the Domestic and International Markets.

Results of Our Study

From our analysis of the priority it was understood that there were five over-arching aspects of controlled environment horticulture for which growers are seeking comprehensive training and information from basic through to advanced instruction. Technology and how it is used to provide the optimal (and most economical) growing environment is the primary consideration of the industry. One of the most interesting outcomes is that the industry is looking for production systems (as well as information and skills) that enable effective management of different crops so that growers can diversify or readily change crops to reflect market conditions.

- A. Greenhouse climate control - selecting and operating appropriate technology to effectively manage and operate the controlled environment system with respect to crop management and crop performance
- B. Implementation of IPM - Practical (and feasible) implementation and integration of pest and disease management decisions and tools (includes selecting and effectively operating appropriate technology)
- C. Marketing flexible controlled environment systems that enable niche marketing and changeable crops
- D. Growing systems - appropriate nutrient, substrate and irrigation management techniques and decision making with respect to crop management and crop performance
- E. Performance benchmarks - financial management including costs of production, making capital purchase decisions (relates to selecting appropriate technology) and operating decisions (relating to optimizing economic performance and management of crops).

What workers require is training and information in –

- Safe and effective use of chemicals
- Identification and management of pests and diseases
- Post-harvest practices – primarily improved grading and packing methods
- Farm and greenhouse hygiene – how and why
- Hydroponics – understanding and managing effectively

Specific information and training priorities:

The specific key priorities identified by us are:

1. Nutrient management
2. Training and development
3. Using climate control properly to manage the greenhouse environment
4. Disease identification and management
5. Using heating properly to manage the greenhouse environment
6. Practical application of biological control agents
7. Measurement and control of EC and pH
8. Crop cultural management
9. Using venting properly to manage the greenhouse environment
10. Hydroponic systems
11. Greenhouse structures
12. Chemicals and their use
13. Environmental management
14. Seedling production
15. Finance and business funding

16. Farm safety
17. Using solar and thermal screens properly
18. General pest and disease management
19. Pest identification and management
20. Marketing

The specific key priorities identified by owners for employees were:-:

1. Crop cultural management
2. Training and development
3. Using climate control properly to manage the greenhouse environment
4. Personal protective equipment
5. Pest identification and management
6. Equipment operation and maintenance
7. Chemicals and their use
8. Spray application and techniques
9. Greenhouse hygiene
10. Using thermal screens properly to manage the greenhouse environment
11. Trolleys and internal transport systems
12. Disease identification and management
13. Measurement and control of EC and pH
14. Farm safety
15. Hydroponic systems
16. Grading and packing systems
17. Monitoring
18. Post-harvest management
19. Team management
20. Plant nutrition

Survey results:

There are some conclusions that could be drawn;

- Growers do not know very much about their own industry, in terms of production area or participants. This is due to lack of Market Intelligence.
- Conventional crops – capsicum, flowers, some herbs, dominate production
- Most growers use soil grown methods inside CEH. There are hardly any growers using Hydroponics which is the future.
- Effective climate control of greenhouses is generally poor, with relatively few structures cooled/heated and many not ventilated. Most closed cultivation is in Poly-houses which have no environment controls and are at best rain shelters and keep flying pests away.
- The industry needs a State-of-the-art training Institute and we want this to be in every state of India and preferably close to large horticultural active regions.

CEH Pre-Employment Program

There certainly exists a demonstrated need for a pre-employment program to introduce intending new industry participants to a comprehensive overview and heightened awareness of Controlled Environment Horticulture (CEH).

Since there no notable horticultural companies using state of the art large greenhouse facilities with a good mix of industry technologies and employment opportunities that includes plant management, picking, packing, grading and transport it is imperative that a completely new privately funded institution needs to be built which will also be earning revenue through production as well as training in CEH.

1. The CEH Pre-Employment program consists of the following agreed elements:
2. It would be on a competency basis (i.e. competency needs to be demonstrated to attain accreditation)
3. The program would include practical elements (i.e. not just theory for accreditation)
4. It would be delivered as a Certificate in Production Horticulture (CEH).

This Centre for Excellence is a Pilot which will be the yardstick for development of other centers in India and all protocols will be generic for the rest of the Centers of Excellence to meet the needs of all national greenhouse growers.

Greenhouse Accreditation and Certification and Portability

Another output from the project will be the development of a portable Greenhouse Accreditation and Certification and Portability”, that will record participant’s accreditation levels. This certification can then be used to provide individual industry recognition that is transferable between employments and workplaces. This will help all people in the industry to move ahead in their career progression.

HGTIPL will keep a record of each and every individual that trains once or many times in our training centers to record and create a national database of accredited CEH operations certified people and only such people holding these qualifications will be allowed to work in CEH environs where owners insist on personnel holding such accreditation.

The Greenhouse Certification will be the catalyst to facilitate industry career pathways by articulating individual achievement and show competency for each CEH level for consideration by all greenhouse enterprises.

To this end, the CEH industry be motivated and encouraged to begin using the above CEH Level terms in regular ‘day to day’ communication to develop familiarity and career pathways.

This kind of a project will help India to attain international standards of growing and help our vegetable industry become competitive within the Domestic and International Markets.

National Accreditation

HGTIPL along with its Foreign Partners, will set the standards and place this before the Education and Agriculture Ministry to attain National accreditation for its courses and qualifications that it will give its students. This national accreditation would then be a catalyst to bring all agricultural students graduating from various universities in India into the agricultural mainstream and stop them from pursuing careers that have no relationship with what they studied.

Most Owner/Grower enterprises will be satisfied to receive personnel who are capable to do the jobs in a professional manner. This approach is considered necessary to ensure equal opportunity for all industry participants (including workers and enterprises) to have a consistent approach to training and career options, therefore building industry capacity and cohesion.

The Pilot Training Centre for Controlled Environment Horticulture

HGTIPL has found a number of market failures that needs to be addressed to make our CEH industry meet and exceed Domestic and International standards.

The market failures detected included a lack of:

- Demonstration facilities
- Specific Hydroponic Education streams
- Centralized training facilities
- Organizations to help and develop & coordinate industry
- Marketing & Promotion of Greenhouse produce
- Urban design principles to facilitate development in key areas
- Natural Gas delivery to key areas
- Bio-control Facilities
- Minor-Use Registration Program
- Model business plans
- Global radiation figures
- Dedicated R&D facilities
- Market access studies
- Appreciation for major water & energy resource efficiencies
- Field grower incentives
- Bumblebees
- Financial Institution Support
- Industry Strategic Plan

HGTIPL is certain that a significant number of gaps could be addressed through the development of a private national greenhouse training institute akin to the Practical Training Centre Plus (PTC+) in Ede, The Netherlands.

Present Scenario in India

Each year, various states of India sponsor chosen farmers to visit horticultural facilities in Israel and spend hundreds of millions of Dollars for the same. Other than this being of tourism value nothing much is really learnt by our farmers due to short duration of the visit plus most of them not being able to easily understand the latest techniques in comparison to India's archaic and conventional methods of growing. If this money is well spent by the country in sending them to HGTIPL's training facilities it will not only be able to save foreign exchange but also tangibly demonstrate how things grow in familiar environs. What's more, threefold numbers or more of farmers interested in CEH can benefit from the training of longer durations.

HGTIPL along with its potential foreign partner, intends to practically train personnel by way of intensive 5-day to 6 months of practical intensive training course at its training centre on computerized environmental control, substrates, water & fertilizer management, post harvest & crop protection.

On the completion of the course, each participant will be presented with a completion certificate based upon the individual certification attained.

HGTIPL will have well developed training facilities that include classrooms connected to a greenhouse/glasshouse (divided into 10 different compartments for 10 different crops and their unique growing technologies), that allows us to immediately put into practice the theory learnt.

The course entry level is aimed at greenhouse managers & consultants. However, ample time is allocated to ensure all participants' needs are met. The course modules that would be covered are subject to feedback from participants and can be tailored to the needs of almost any group.

Our main instructors' initially will be foreign trainers with the highest and best credentials and also trainers who have also worked in CEH in foreign nations. There will also be special courses to train personnel as trainers for the future to reduce dependence on foreign personnel after the first five years.

HGTIPL's Training Institute will not be intended to be just a training institute but will in addition, also offers a number of other roles that have been identified by us such as:

Centralized Training Facilities-a location that delivers industry specific training in both theory and practical nature.

Demonstration Facilities- to showcase both existing, new and emerging technology and how to integrate these into growers systems.

Dedicated R&D Facilities- to ensure our technology driven industry adapts to conditions and crops.

Field Grower Incentives- demonstrate alternative production techniques to traditional farmers.

Model Business Plans- developed using centre's growing technology for each crop.

Minor-Use Program-a location to assist with efficacy trials on new greenhouse products.

Bio-control Facilities-potential area to develop or trial new greenhouse bio-controls and beneficial insects.

Energy & Water Efficiencies- Centre for industry research into resource utilization and efficiencies.

Our proposed Greenhouse Training Institute

Has the capacity to lift the entire industry through targeted education and research.

Can assist in overcoming grower reluctance to invest in unfamiliar (yet proven) technology Sets industry standards and targets (both quality & production).

Will demonstrate best-practice growing techniques for Indian greenhouse crops.

Will be a centre for Asia/Middle East and Africa education and training in greenhouse crops and technologies and targeting even their growers.)

All Agricultural Universities as well as private companies will be encouraged to enter into a partnership with HGTIPL's Institute to develop & deliver specialist industry training.

The Centre will be based on PTC+ Model (Theory & practical)

It would include classrooms, growing systems, structures, common technology, café, catering, admin, student accommodation etc.

Crops targeted – tomatoes, capsicum, strawberry, cucumber, lettuce & herbs, rose, gerbera et al.

It would need to be located in ways for best industry return (TBA).

Potential funding sources would include: PE funds, Angel Investors, Private Individuals and Government Institutions etc.

The expected Capital and Infrastructure costs are yet to be determined.

Another issue of concern to the industry is the reluctance of existing growers to adopt innovation and invest in new technologies that are crucial to keeping pace with global production and quality standards.

This proposal to establish a Training Centre for CEH would ultimately encourage existing and new growers to adopt and invest by showing them how to integrate new and emerging technologies into their own systems.

A CEH -Greenhouse Training Centre can meet a significant number of identified industry failures and help the industry which actually has potential to feed the world at large.

HGTIPL has been asked by 2 Universities to investigate proposals for these facilities. Both have approached HGTIPL to deliver this training facility.

PTC+ MOU

HGTIPL Chairman and Founder, Lt Cdr (ret) CV Prakash has travelled a lot visiting resource people and Institutions around the world and has brought umpteen resources into its ambit.

We, in India wish to emulate the developed worlds' growers in terms of technology and varieties, however if we aim to match their quality, efficiency & productivity, then

industry up-skilling is mandatory. A premier world class Institute as envisioned by HGTIPL, can surely offer this and much more, to realize this dream.

This proposed Training Centre for Controlled Environment Horticulture is a direct outcome of the study done by HGTIPL over the last four years and has received support from all serious growers and industry stakeholders we met and interacted with so far.

Conclusion

HGTIPL is very eager to be the harbinger of this in India along with the developed companies in horticulture from around the world. We await the interest from investors that will firmly establish their credentials in India.

The establishment of such a Centre for Excellence in Controlled Environment Horticulture will be the start of a new beginning in the annals of Indian Horticulture.

We wish that this dream comes true very soon.

Media coverage

During the research program, effective use was made of the Social Media platforms - LinkedIn, Facebook and Twitter.

LinkedIn:

Primary utilization was made of Tony Bundock's LinkedIn account, with secondary utilization through Stephen Manallack's personal LinkedIn account.

Facebook:

Primary utilization was made of the Genesis Horticultural Solutions account, with secondary utilization through Stephen Manallack's personal Facebook account.

Twitter:

Primary utilization was made of the Genesis Horticultural Solutions account.

Social media posts were made on a daily basis and are shown in this section of the report along with hits to the date of Wednesday the 18th of December 2019.

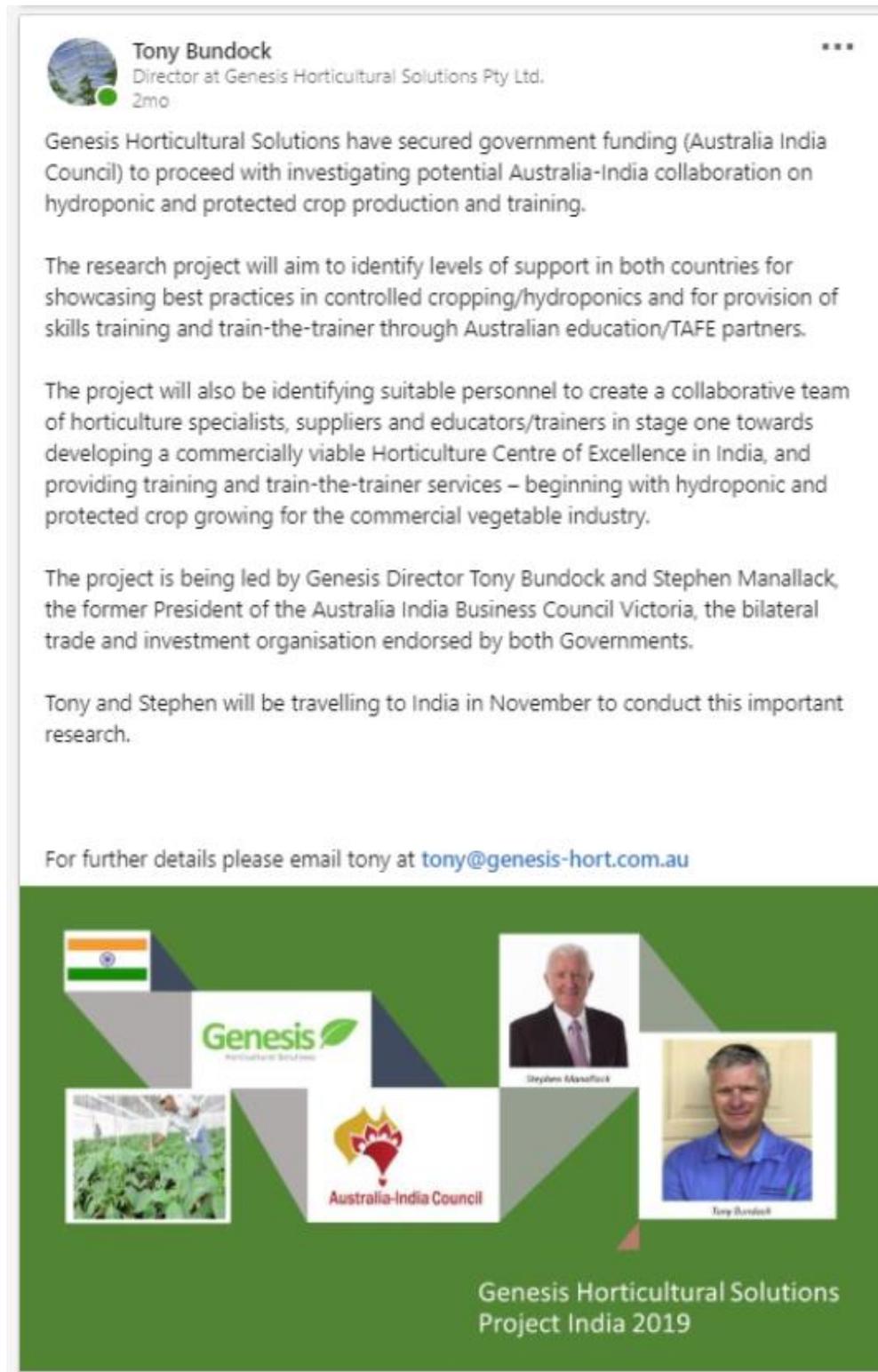
Hortidaily is:

A Dutch based e newsletter that covers an international audience on a daily basis across Monday to Friday.

Hortidaily reported on the initial distance training for Indian students and provided a summary report at the conclusion of the research travel program.

Social media - details of all LinkedIn posts

LinkedIn post – Friday 6th September 2019



Tony Bundock
Director at Genesis Horticultural Solutions Pty Ltd.
2mo

Genesis Horticultural Solutions have secured government funding (Australia India Council) to proceed with investigating potential Australia-India collaboration on hydroponic and protected crop production and training.

The research project will aim to identify levels of support in both countries for showcasing best practices in controlled cropping/hydroponics and for provision of skills training and train-the-trainer through Australian education/TAFE partners.

The project will also be identifying suitable personnel to create a collaborative team of horticulture specialists, suppliers and educators/trainers in stage one towards developing a commercially viable Horticulture Centre of Excellence in India, and providing training and train-the-trainer services – beginning with hydroponic and protected crop growing for the commercial vegetable industry.

The project is being led by Genesis Director Tony Bundock and Stephen Manallack, the former President of the Australia India Business Council Victoria, the bilateral trade and investment organisation endorsed by both Governments.

Tony and Stephen will be travelling to India in November to conduct this important research.

For further details please email tony at tony@genesis-hort.com.au



The graphic features a green background with several elements: the Indian flag, the Genesis Horticultural Solutions logo, a photo of Stephen Manallack, a photo of Tony Bundock, and the Australia-India Council logo. Below these is the text 'Genesis Horticultural Solutions Project India 2019'.

Views to 18/12/2019 – 3656

LinkedIn post – Wednesday 2nd October 2019



Tony Bundock
Director at Genesis Horticultural Solutions Pty Ltd.
1mo

The Genesis research project is now being formally promoted via the government website - looking forward to undertaking this research!
[#genesishorticulturalsolutions](#) [#priva](#) [#cravo](#) ...see more

Australian Government
Department of Foreign Affairs and Trade

Home + People-to-people + Foundations, councils and institutes + Australia-India Council + Grants + Grants 2019-20
+ Developing India-Australian Collaboration Towards a Horticulture Centre of Excellence

Grants

- Grant guidelines
- Grants 2019-20**
- Grants 2018-19
- Grants 2017-18
- Grants 2016-17
- 2019 grant round outcomes
- 2018 grant round outcomes
- 2017 grant round outcomes
- 2016 grant round outcomes
- 2015-16 grant round outcomes

Developing India-Australian Collaboration Towards a Horticulture Centre of Excellence

Category: [People to people](#)



Modern technology to aid the Indian horticultural industry. Credit: Tony Bundock.

59 · 8 Comments

Like Comment Share

3,089 views of your post in the feed

Views to 18/12/2019 – 3098

Linkedin post – Sunday 3rd November 2019

 **Tony Bundock**
Director at Genesis Horticultural Solutions Pty Ltd.
2w

Our AusIndia Council funded Indian research project is up and running, commencing with an excellent site visit to The J Farm Research Centre (project of Tractor and Farm Equipment - TAFE) in Kelambaakkam, India.

Great insight into how Dr Srinivasen and his team are approaching training and education for the Indian Farming Community, and identification of pathways to assist in future training initiatives. @dfat @AusIndiaCouncil @GenesisHort



Views to 18/12/2019 – 2490

Linkedin post – Monday 4th November 2019



Views to 18/12/2019 – 2252

Linkedin post – Tuesday 5th November 2019



Views to 18/12/2019 – 723

Linkedin post – Wednesday 6th November 2019



Views to 18/12/2019 – 978

LinkedIn post – Thursday 7th November 2019

 **Tony Bundock**
Director at Genesis Horticultural Solutions Pty Ltd.
1w

Really great to spend time with two key identities who know the Indian horticultural marketplace, and provided sound advice on where developments in technology introduction may be possible. Thanks to Sachin Kulkarni of ProActive Agri Solutions Pvt Ltd, and independent Agricultural consultant - Anil Patil for their input and time.
[#dfat](#) [#AusIndiaCouncil](#) [#GenesisHort](#)



Genesis team with Sachin Kulkarni (left) and Anil Patil (right)



Views to 18/12/2019 – 806

Linkedin post – Friday 8th November 2019



Views to 18/12/2019 – 1475

Linkedin post – Saturday 9th November 2019



Views to 18/12/2019 – 905

Linkedin post – Sunday 10th November 2019

 **Tony Bundock**
Director at Genesis Horticultural Solutions Pty Ltd.
6d

A great meeting this morning with Rajender Kumar and Shashank Jain of the Cravo company.
Some excellent insights into how the Indian corporate sector is working with Cravo to develop commercial vegetable production with the use of retractable roof structures, and the associated and ongoing need for training of staff and trainers.
[#dfat](#) [#AusIndiaCouncil](#) [#GenesisHort](#) [#cravo](#)



Views to 18/12/2019 – 744

Linkedin post – Monday 11th November 2019



Views to 18/12/2019 – 988

LinkedIn post – Tuesday 12th November 2019



Views to 18/12/2019 – 1682

LinkedIn post – Wednesday 13th November 2019

 **Tony Bundock**
Director at Genesis Horticultural Solutions Pty Ltd.
4d

After a very busy couple of weeks it's good to be back in Australia. Thanks to Hortidaily for the following article relating to our project. Now for some serious report writing! #dfat #AusIndiaCouncil #GenesisHort



"Water management one of the biggest challenges for Indian growers"
hortidaily.com

Views to 18/12/2019 – 784

Social media - details of all Facebook posts

Facebook post – Friday 6th September 2019

Genesis Horticultural Solutions
September 6 · 🌐

Genesis Horticultural Solutions is proud to announce that it has secured government funding (Australia India Council) to proceed with investigating potential Australia-India collaboration on hydroponic and protected crop production and training.

This is a research project looking at understanding the state of play in this sector in India – identifying business and education/skills training opportunities and partnerships.

The project will aim to identify levels of support in both countries for showcasing best practices in controlled cropping/hydroponics and for provision of skills training and train-the-trainer through Australian education/TAFE partners.

The project will also be identifying suitable personnel to create a collaborative team of horticulture specialists, suppliers and educators/trainers in stage one towards developing a commercially viable Horticulture Centre of Excellence in India, and providing training and train-the-trainer services – beginning with hydroponic and protected crop growing for the commercial vegetable industry.

The project is being led by Genesis Director Tony Bundock and Stephen Manallack, the former President of the Australia India Business Council Victoria, the bilateral trade and investment organisation endorsed by both Governments.

Tony and Stephen will be travelling to India in November to conduct this important research, and further detail will be posted via our various social media sites.

For further details please email tony at tony@genesis-hort.com.au

Genesis Horticultural Solutions
Project India 2019

Views to 18/12/2019 – 92

Facebook post – Monday 4th November 2019



Views to 18/12/2019 – 92

Facebook post – Tuesday 5th November 2019



Views to 18/12/2019 – 92

Facebook post – Wednesday 6th November 2019



Views to 18/12/2019 – 80

Facebook post – Thursday 7th November 2019



Views to 18/12/2019 – 52

Facebook post – Friday 8th November 2019



The image is a screenshot of a Facebook post from the page 'Genesis Horticultural Solutions'. The post is dated 'November 8 at 3:39 PM'. The text of the post reads: 'Really great to spend time with two key identities who know the Indian horticultural marketplace, and provided sound advice on where developments in technology introduction may be possible. Thanks to Sachin Kulkarni of ProActive Agri Solutions Pvt Ltd, and independent Agricultural consultant - Anil Patil for their input and time. #dfat #AusIndiaCouncil #GenesisHort'. Below the text are two side-by-side photographs. The left photo shows three men standing in front of a wall with 'Genesis Horticultural Solutions Bangalore Centre' written on it. The right photo shows the same three men in a different setting. Below the photos is the caption: 'Genesis team with Sachin Kulkarni (left) and Anil Patil (right)'. The Genesis Horticultural Solutions logo is visible in the bottom right corner of the post area.

Genesis Horticultural Solutions
November 8 at 3:39 PM · 🌐

Really great to spend time with two key identities who know the Indian horticultural marketplace, and provided sound advice on where developments in technology introduction may be possible. Thanks to Sachin Kulkarni of ProActive Agri Solutions Pvt Ltd, and independent Agricultural consultant - Anil Patil for their input and time. #dfat #AusIndiaCouncil #GenesisHort



Genesis team with Sachin Kulkarni (left) and Anil Patil (right)

Genesis 
Horticultural Solutions

Views to 18/12/2019 – 158

Facebook post – Saturday 9th November 2019



Views to 18/12/2019 – 175

Facebook post – Sunday 10th November 2019

 **Genesis Horticultural Solutions** November 10 at 10:44 AM · 🌐

A review of the training program we assisted with prior to visiting India. #dfat #AusIndiaCouncil #GenesisHort



AIS Greenworks is with Saskia Blanch. November 10 at 9:31 AM · 🌐

Indian academics come to Australia to study hydroponic greenhouses. Read more here: https://www.aisgreenworks.com.au/showcasing-australian-gre... #ICIIndustries

Views to 18/12/2019 – 70

Facebook post – Monday 11th November 2019



Views to 18/12/2019 – 58

Facebook post – Tuesday 12th November 2019



Views to 18/12/2019 – 58

Facebook post – Wednesday 14th November 2019



Views to 18/12/2019 – 77

Facebook post – Saturday 16th November 2019

 **Genesis Horticultural Solutions** November 16 at 12:05 PM · 🌐

After a very busy couple of weeks it's good to be back in Australia. Thanks to Hortidaily for the following article relating to our project. Now for some serious report writing! #dfat #AusIndiaCouncil #GenesisHort <https://www.hortidaily.com/.../water-management-one-of-the-b.../>



HORTIDAILY.COM
"Water management one of the biggest challenges for Indian growers"



Views to 18/12/2019 – 64

Social media - details of all Twitter posts

Twitter 'Tweet' - Monday 4th November 2019



Tony Bundock @GenesisHort · Nov 4

Excellent site visit to The J Farm Research Centre (project of Tractor and Farm Equipment - TAFE) in Kelambaakkam, India. Great insight into how Dr Srinivasen and his team are approaching training and education for the Indian Farming Community. @dfat @AusIndiaCouncil @GenesisHort



Views to 18/12/2019 - 230

Twitter 'Tweet' – Tuesday 5th November 2019



Tony Bundock @GenesisHort · Nov 5

A busy day in Chennai with meetings. We met with Petula Thomas (pictured) who is the dynamic Director of the Indo-Australian Chamber of Commerce. We also met with Dr N Subbaiyan who is the Director of the Tamil Nada Horticulture Development Agency. Strong potential partnerships!



Views to 18/12/2019 – 205

Twitter 'Tweet' – Wednesday 6th November 2019



Views to 18/12/2019 – 219



Views to 18/12/2019 – 194

Twitter 'Tweet' – Friday 8th November 2019



Tony Bundock @GenesisHort · Nov 8

Thanks to Sachin Kulkarni of ProActive Agri Solutions Pvt Ltd, and independent Agricultural consultant - Anil Patil for their input and time in providing sound advice on where future technology developments and training may be possible. #dfat #AusIndiaCouncil #GenesisHort



Genesis team with Sachin Kulkarni (left) and Anil Patil (right)



Views to 18/12/2019 – 207

Twitter 'Tweet' – Saturday 9th November 2019

 **Tony Bundock** @GenesisHort · Nov 9

We met with Mukesh Malhotra, the MD of Weikfield Products Ltd, & learnt how they are developing training for farmers to diversify into small scale hydroponic systems. We will be able to assist in the design of system and training programs. #dfat #AusIndiaCouncil #GenesisHort



Views to 18/12/2019 – 92

Twitter 'Tweet' – Sunday 10th November 2019

 **Tony Bundock** @GenesisHort · Nov 10

A review of the training program we assisted with prior to visiting India. #dfat #AusIndiaCouncil #GenesisHort



Showcasing Australian Greenhouse Production to Ac...
More than 20% of the world's population lives in India
[...]
aisgreenworks.com.au

Views to 18/12/2019 – 162

Twitter 'Tweet' – Monday 11th November 2019

 **Tony Bundock** @GenesisHort · Nov 11

We met Rajender Kumar and Shashank Jain of the Cravo company who highlighted how Cravo are assisting commercial vegetable production with the use of retractable roof structures, and the ongoing need for training of staff and trainers. #dfat #AusIndiaCouncil #GenesisHort #cravo



Views to 18/12/2019 – 204

Twitter 'Tweet' – Tuesday 12th November 2019



Tony Bundock @GenesisHort · Nov 12

We met with Jain Irrigation who look after the irrigation needs of over 6 million farmers! Many thanks to Dr Sangita Ladha for her time today to look at potential Australia - Indo cooperation in developing future hydroponic training programs. #dfat #AusIndiaCouncil #GenesisHort



Views to 18/12/2019 – 261

Twitter 'Tweet' – Wednesday 14th November 2019



Tony Bundock @GenesisHort · Nov 14

Quite a privilege to be invited to the Australian High Commission in Delhi to meet with John Southwell (Counsellor Agriculture) and Susan Mathew (Senior Research Officer) to highlight the progress and future direction of our project. [#dfat](#) [#AusIndiaCouncil](#) [#GenesisHort](#)



Views to 18/12/2019 – 191

Twitter 'Tweet' – Saturday 16th November 2019



Tony Bundock @GenesisHort · Nov 16

After a very busy couple of weeks it's good to be back in Australia. Thanks to Hortidaily for the following article relating to our project. Now for some serious report writing! #dfat #AusIndiaCouncil #GenesisHort



"Water management one of the biggest challenges f...
"One of the biggest challenges for Indian growers is water management. Securing a water supply and ...
hortidaily.com

Views to 18/12/2019 – 129

Hortidaily Article – Saturday 16th November 2019

Advertise About Us Privacy PlantDaily MMDaily.com Greenhouses Agri Freshplace Italiana Español Français

News
Search
Job Offers
Photos
Calendar
Contact
Buyers Guide

More info on www.rijkswaan.com/solutions/organic

Tony Bundock visiting India

"Water management one of the biggest challenges for Indian growers"

"One of the biggest challenges for Indian growers is water management. Securing a water supply and having an efficient application system is key to success for many growers." Speaking is Genesis Horticultural Solutions director Tony Bundock. He has just returned to Australia from India, after undertaking an Australian Government-funded research project looking at how the two countries can potentially collaborate in the Horticultural sector.

The Genesis team at the Australian High Commission – New Delhi. Left to right Tony Bundock, Stephen Manalack, John Southwell (Counselor Agriculture) and Susan Mathew (Senior Research Officer)

Australian - Indian centre

The project has been funded by the Australia – India Council, and the intent of the project has been to look at potentially setting up an Australian – Indian centre of excellence to further enhance the skills of the Indian horticultural sector.

"The Indian market is huge and ranges from very small scale family farms growing vegetables, to the large scale corporate farms utilising retractable roof greenhouses and hydroponics", said Tony.

"I believe that educating growers in utilising automation to irrigate via such parameters as radiation sum as opposed to just time and/or volume would see a greater efficiency in crop and water management for many smaller growers."

Out of the soil

He explains how the introduction of such technology and associated training could well be provided by Australian suppliers. "And moving growers out of the soil into basic hydroponic substrate growing is another area for development where soil-borne diseases and salinity issues are present."

Joining Tony on the trip was the previous Chairman of the Indo-Australia Council, Stephen Manalack. Stephen has visited India eleven times and has a wealth of knowledge about the region.

OPTIMIZE

Plant roots development anytime, anywhere

For Banks, ND & Harrow

Looking for retailers/partners

Find out more

Choose

Build 2 Grow

- Increase Profits
- Real Time Tracking & Alerts
- Cloud Based Technology
- Real-time monitoring

www.gremonsystems.com

HRC
www.h24.co.ke
Grafting.



An easy grafting like a magic,
The desire comes true in HRC.

Announcements

Click here to receive this news directly in your inbox.



Job Offers

Ignify
Laboratory & Project Manager

- Laboratory / Project Manager - Almeria, Spain
- Junior buyer/ seller - Almeria, Spain
- Office and Sales Administrator - Almeria - Schagen, Nederland
- Breeder
- Greenhouse Plant Propagator - Dursville (Orlando) Canada



Tony Bundock and Stephen Manalack discuss vegetable production methods with the training staff at 'J' Farm Research Centre – Chennai.

Interviews

Tony and Stephen were in India for twelve days and visited Chennai, Bangalore, Mumbai and New Delhi and conducted over twenty-two site visits and face to face interviews during this time.

"It was a fairly fast-paced event, and we were keen to trap as much information as we could over the limited time we had available," said Tony.

There are also some further interviews to be conducted via internet software – Zoom - for companies that Tony and Stephen were unable to visit during their visit.

The findings of the team will be collated in a formal report which will identify areas of further potential collaboration and mutually beneficial trade opportunities for both parties.

For further details:
Genesis Horticultural Solutions
Tony Bundock
Ph: +61 409 007 610
Email: tony@genesis-hort.com.au
Web site: www.genesis-hort.com.au



Publication date: Fri 15 Nov 2019

© HortDaily.com / Contact

GREENHOUSES ADAPTED TO YOUR NEEDS
HARNois



Email this article | Print

Receive the daily newsletter in your email for free | [Click here](#)



Pelemix
Professional Horticulture

Hazera
Seeds of Growth

VENTIGUARD
www.ventiguard.com



Van der Waay



Growtech

Relationships formed

Everyone that the Genesis team met will become a highly valuable relationship contact as this project continues.

Of particular importance are the relationships formed in developing the “Four Collaborative Horticulture Groups” as outlined earlier in our report.

Genesis Horticulture Solutions Pty Ltd has become a member of the Indo-Australia Chamber of Commerce.

Bibliography

Area and production of horticultural crops for 2018 -19 (3rd Advance estimates) – Department of Agriculture, Cooperation & Farmers Welfare Ministry of Agriculture & Farmers Welfare, Government of India

Annual Report 2018 -19 – Department of Agriculture, Cooperation & Farmers Welfare Ministry of Agriculture & Farmers Welfare, Government of India

Harvesting golden opportunities in Indian agriculture: from food security to farmers' income security by 2025 – Goyal A, Rajagopalan C, Goedde L, & Nathani N (2017)

Augmenting Water Use Efficiency in Horticulture - Malhotra S.K. and Das M

Indian farm size shrank further by 6% in 5 years to 2015-16 - Mukherjee S (2019)



Genesis Horticultural Solutions

Policy paper on the key considerations relevant to the “Development of a Commercially viable Horticultural Centre of Excellence within India” – project. Application AIC2019197

Co-authored by Tony Bundock and Stephen Manallack

India and Australia can become the major “food bowls” of the Indian Ocean region, if the two countries can find a way to collaborate in horticulture. The region includes some of the world’s fastest growing middle classes, including much of Africa, the Middle East, India and its neighbours and Southeast Asia.

The Indian horticulture sector already faces pressure for change, presenting Australia with a once in a lifetime opportunity to build a collaborative commercial relationship with India.

Pressures for change in India are market driven as the middle class grows, Government driven with a push to bigger farms, mining industry driven as it seeks to play a positive community development role and horticulture industry driven, as farmers want innovation as a pathway to better incomes.

Market driven changes result from a growing middle class anxious about the content, health outcomes and quality of the vegetables and fruits they buy. Plus, a whole range of vegetables labelled as “exotic” in India now face rapidly rising demand – broccoli, cherry tomatoes, capsicums, parsley, celery, cabbages, zucchini and asparagus. Berries are becoming sought after, especially blueberries and strawberries.

Government driven changes are creating one of the biggest historical shifts in rural India – the new Farmer Product Organisations (FPO). The Government has set an aim for 10,000 of these collaborative ventures. An FPO is a grouping of at least 10 and up to 500 farmers into a collective including marketing. The Government will fund these FPO’s and possibly farm subsidies will be distributed via them.

The FPO structure is currently in need of support services to enable them to secure business acumen, market linkages, better insurance terms, quality assessment infrastructure, precision agriculture solutions for better crop management, access to finance, IoT based applications and more.

At the same time India's agricultural research centres (Central, State and private) are very keen to be part of the solution and become a focus for knowledge and training in horticulture techniques new to India. Their demand for displays and services around hydroponics and protected cropping is very high.

Miner driven changes result from delays and obstruction from farmers, and awareness that by supporting horticulture innovation around mines, they can contribute to increasing the income of farmers and provide new income for rural women – thereby making a contribution to the livelihoods of the communities they operate in.

Indian farmer driven changes follow complaints of declining incomes and knowing they have an inability to meet the needs of the new middle class, at home and in the Indian Ocean region. Women in rural communities are seeking new ways to add income to households.

While farmers are traditionally conservative, there is growing awareness in India of the need for “new skills and innovations for new products”.

Facing these demands for change, India is not inclined to simply import and adopt western approaches – rather, it seeks to create Indian style innovations with global partners who can adapt to this demand. The Israel and Netherlands governments have established free standing centres of horticulture excellence, with low levels of interest and participation. Australia can move into this space if it is prepared to adapt to what India wants.

What will be needed for these changes? Skills training and train the trainer programs, IT systems, adapted hydroponics and adapted protected cropping systems and products, post-harvest storage and to market systems and a combination of displays and training at Government and private research centres (not free standing).

Protected Cropping (PC) opportunities are huge but need to be tailored for India – including shelter by artificial structures and materials, enabling modified growing conditions and protection from pests and adverse weather. In the mix here are greenhouses and glasshouses, shade houses, screen houses and crop top structures.

Hydroponics and Controlled Environment Horticulture (CEH) - the most modern and sophisticated form of protected cropping – might be relevant to corporate farms in India with some key adaptations, creating “modified hydroponics”. CEH combines high technology greenhouses with hydroponic (soil-less) growing systems. CEH makes it possible to consistently and reliably control or manipulate the growing environment and effectively manage nutrition, pests and diseases in crops.

Hydroponics in Australia and the west is crop production using a soilless growing medium with nutrients supplied in a liquid form. The choice of substrate can be varied to suit the crop and climatic requirements. Hydroponic growing also includes growing in a flowing nutrient stream without utilising a solid medium. This is known as nutrient film technique. For India, some adaptation of drip irrigation, soil and non-soil bases leads to “modified hydroponics” and would meet demand over there.

Agricultural research centres in India play a major role in supporting farmer innovation and skills upgrades. There is an opportunity for an Australian Centre of Protected Cropping and Hydroponics to be embedded in at least one of the Indian Government agricultural research centres, another with the State of Tamil Nadu and in a private research centre. These could be supported by a “virtual centre” with farmers accessing it via mobile phones.

This would be a major step forward in building a genuine India-Australia collaboration in horticulture, enhancing the capacity of both countries to become the food bowls of the Indian Ocean.